HOME HAND-BOOK

OF

DOMESTIC HYGIENE

AND

RATIONAL MEDICINE

Yours truly,
J. H. Kellogg

THE HOME HAND-BOOK

DOMESTIC HYGIENE

RATIONAL MEDICINE.

BY J. H. KELLOGG, M.D.,

President of the Medical Missionary College, Battle Creek, Mich.; Member of the British Gynæcological Society; International Periodical Congress of Gynæcology and Obstetrics; American Association of Obstetricians and Gynecologists; British and American Associations for the Advancement of Science; the Société d'Hygiène de France; Pan-American Congress of Religion and Education; American Society of Microscopists; American Electro-Therapeutic Association; American Climatological Society; American Medical Association; Mississippi Valley Medical Association; Tri-State Medical Society; Michigan State Medical Society; Superintendent of the Battle Creek (Mich.) Sanitarium; Superintendent Sanitarium Laboratory of Hygiene.

THIRTIETH THOUSAND REVISED AND ENLARGED

LONDON
INTERNATIONAL TRACT SOCIETY LIMITED,
59, PATERNOSTER ROW.

PREFACE TO REVISED EDITION.

In the sixteen years which have elapsed since this volume was written, a number of large editions have been printed. Revisions and additions have been made from time to time as new editions have appeared, but the great advances which have been made within the last few years in all branches of practical medicine have induced the author to undertake the re-writing of a considerable portion of the work, as well as the addition of much new matter. This task has occupied a considerable length of time, as the author's regular duties as superintendent of a large Sanitarium, and editor of four monthly journals devoted to sanitary and medical topics, give him very little leisure for extra work. It is hoped that those who have been waiting for the appearance of this revised and re-written edition, will be repaid for the strain upon their patience, as an earnest effort has been made to have this volume represent in the most complete manner possible, the present advanced status of rational medicine, in so far as the subject can be appropriately presented in a popular treatise, and to omit nothing essential to its practical completeness.

A large number of new subjects have been added — many in the body of the work, and still others in the Appendix — also a number of new and original cuts and plates. Since the first edition of this work was published, the author has had the privilege of twice visiting Europe for the purpose of medical study and observation, and has continued his labors as superintendent of the Battle Creek Sanitarium, which has afforded abundant opportunity for testing the value of the various dietetic and other hygienic precepts which are presented in this work, together with the recommendations made respecting the treatment of disease, both acute and chronic. Various lines of research in relation to hygienic and medical questions have been continually carried on in the physiological and food laboratories connected with the Battle Creek Sanitarium; and the results of these observations, which have been published from time to time in numerous medical journals in this country and Europe, are now to a large extent summarized in this work. The recommendations made in this volume are not based upon purely theoretical grounds, but have a foundation in practical experience.

It is with no small amount of pleasure that the author has witnessed the marvelous progress which has been made in all departments of rational medicine within the last sixteen years. When the first edition of this work was published, many of the measures therein recommended were looked upon with more or less distrust by a large proportion of the medical profession, as they were at that time little known in this country. This was particularly the case in regard to the chapters relating to hydrotherapy and motortherapy, or Swedish movements. The same might also be said in reference to electrotherapy, which, sixteen years ago, was not yet fully adopted by the profession as a branch of rational therapeutics. At the present time, however, these three important departments of physiological therapeutics may be regarded as enjoying as firm a position in the confidence of the profession, and as having as thorough a scientific foundation in physiological research, as any other branch of therapeutics.

The germ theory relating to disease which was thoroughly indorsed in the first edition of this work, although at that time regarded by the majority of physicians with but a small degree of confidence, has since achieved complete triumph, and is now fully accepted by the profession. The labors of numerous bacteriologists and physiological chemists, notably Pasteur, Koch, and their followers in Europe and other countries, have, during the past few years, revealed to the world a vast number of new facts of immense importance. As the result of these discoveries, new light has been thrown upon almost every disease to which human flesh is heir. The labors of Professor Bouchard, the eminent French physiologist, have been especially prolific in beneficent results. He has shown in a most conclusive manner that the body is a factory of poisons, and that a large share of the common ailments from which human beings suffer are the result of the over-accumulation of these poisons through deficient elimination, or of their production in excessive amount, resulting in self-poisoning, or autointoxication. The full practical bearing of these new facts has been considered in the revision and re-writing of this volume, the usefulness of which it is believed will be greatly enhanced thereby.

In conclusion, the author desires to express his gratitude for the cordial welcome which this work has received at the hands of the public wherever it has been introduced, and especially for the courteous manner in which it has been treated by his brethren in the medical profession, to whose commendation the very large circulation of the work must be chiefly attributed.

Having closely adhered to the original plan of the work as stated in the preface of the first edition, and having added to this edition many things which it is hoped will be recognized as improvements, the author

entertains the hope that the work in its present form will be considered to merit the approval which has heretofore been accorded it, and the courtesy with which former editions have been received. J. H. K.

BATTLE CREEK, MICH., DEC. 28, 1895.

PREFACE TO FIRST EDITION.

IT is unnecessary to argue the importance of a work of the character which this volume is intended to possess, since the demand for popular works relating to the preservation of health and the treatment of disease has increased so greatly, particularly within the last few years, that books of no other class are in such constant and general demand, if we except the indispensable family Bible. The common people, as well as the higher classes of society, are coming to think and investigate for themselves on all subjects of practical importance; and it is not surprising that there should be a general and increasing interest in subjects which involve the most vital of human interests,—life and health. There can be urged no reason of real weight why men and women of intelligence should not have an opportunity to acquire knowledge on all useful subjects which can be brought within their reach. This fact has been well recognized in nearly every department of science, and at the present day, thanks to the labors of such eminent scientists as Prof. Proctor, Dr. Huxley, Prof. Tyndall, Rev. James G. Wood, and numerous other workers in various scientific fields, the great storehouse of knowledge into which the accumulated wealth of the ages has been garnered, opens its doors almost as widely and freely to the wayfaring man, the laborer, or the most humble seeker after truth, as to the professor or the savant. New scientific facts are no longer held as secrets by their discoverers, to be imparted only to those who have the opportunity of sitting at the feet of learned professors in the temples of science, but are spread before the great masses of the common people in popular language, thus making each new acquisition to scientific knowledge the property of the entire civilized portion of the race. The pioneers in this noble work of elevating the people by sharing with them the golden treasures of scientific lore have not accomplished these grand results without opposition, oftentimes most bitter and unrelenting, from many men of equal rank with themselves as philosophers and scientists. It has been urged that science would lose somewhat of its dignity if its truths were cheapened by popularization. The experiment has been tried, however, and the result is in the most

eminent degree satisfactory. Science has lost some of its mystery, but has gained the confidence of thousands who before looked upon its choicest truths as the most monstrous vagaries.

The science of medicine has been passing through this same ordeal. Medical scientists are, of all classes of scientific workers, the most conservative. The wonderful revolutions which have overturned the fossil theories carefully hoarded in other departments of scientific research, and established new and better theories, have affected medicine much less than other branches, and hence we find many still clinging to notions which originated in an age when learning of all kinds was yet in a most primitive state; and one of these is the notion that the common people have no business with medical knowledge. It is fortunate that the adherents of this view are constantly decreasing. The more advanced and liberal class of thinkers in the profession are taking the same ground with reference to medicine that has already been very generally conceded for other departments of science; viz., that every human being has a perfect right to acquire every atom of knowledge that he is capable of comprehending. It seems beyond question that every human being has the right to know all about himself; and of all classes of knowledge none is so important as that which relates to the preservation of human life and the alleviation of human suffering.

The people have ever manifested an eagerness to obtain information on subjects of the character treated of in this volume, which fact has been seized upon by charlatans, and made a source of pecuniary profit through the sale of worse than worthless trash, on various medical topics, which has been sown broadcast over the country. Every newspaper teems with advertisements of medical pamphlets and books on special subjects for sale or to be given away, which are simply adroit means of advertising the authors, whose ignorance is only equaled by their impudence and mendacity. The evil results arising from the wide dissemination of this kind of popular medical literature has undoubtedly been one of the great causes of the deep prejudice existing in the minds of many eminent physicians against the popularization of medical facts; but this is really a most powerful reason for the production of a better class of literature to supply the existing demand, and to counteract the influence of the shameless pretensions of ignorant quacks and scheming charlatans.

It has also been objected to works of this character that they are likely to do harm by teaching people to rely upon themselves instead of calling in a physician when professional services are really required. However true this may be of some popular treatises on disease and medication, it is certainly no part of the object of this work to in any way de-

tract from the dignity or usefulness of the profession of which the author is proud to be a member. In fact, the very contrary has been one of the chief aims in the production of this work. The following present the principal objects in view in the preparation of this volume:—

1. To present in a popular and condensed form the latest and most reliable information on the subjects of Anatomy, Physiology, and Hygiene. Considerable space has been devoted to the description of the structure and functions of the various organs of the body, (1) because these subjects lie at the very foundation of all scientific medical knowledge; (2) because they have been universally neglected in works of a similar character.

2. To call special attention to the causes of disease and the best means of prevention. It is universally admitted at the present time that preventive medicine is of far greater importance than curative medication, and many of the most eminent members of the profession are devoting themselves exclusively to this branch. It has been attempted to make this work the most complete on this subject of any popular treatise published.

3. To supply information respecting simple measures of treatment that can be employed by persons of ordinary intelligence in the absence of a physician, or when a physician cannot be obtained at once, or need not be called, as in cases of accidents and common diseases or injuries which require only good nursing and the employment of simple remedies; and also to render people competent to second the efforts of the physician.

4. To impress the importance of giving prompt attention to the first departures from health, and by controlling small beginnings in order to prevent serious results.

5. To give a sufficiently clear outline of the nature of disease and of the most approved methods of treatment to enable the reader to discriminate between the wise and reliable physician and the charlatan.

How well we have succeeded in accomplishing the objects sought, the reader must be left to decide. No pains or expense have been spared to make the work all that could be desired in a hand-book of this kind. The methods of treatment suggested are such as are recommended by the most eminent and scientific members of the profession, and such as have been found most effective in the author's experience.

If it be remarked that drugs are recommended less frequently as remedies than in most similar works, it may be answered that the author does not approve of the custom of making an apothecary shop of the stomach by dosing for every trifling ailment of any part of the body. In his opinion, the use and prescription of drug remedies should be left almost

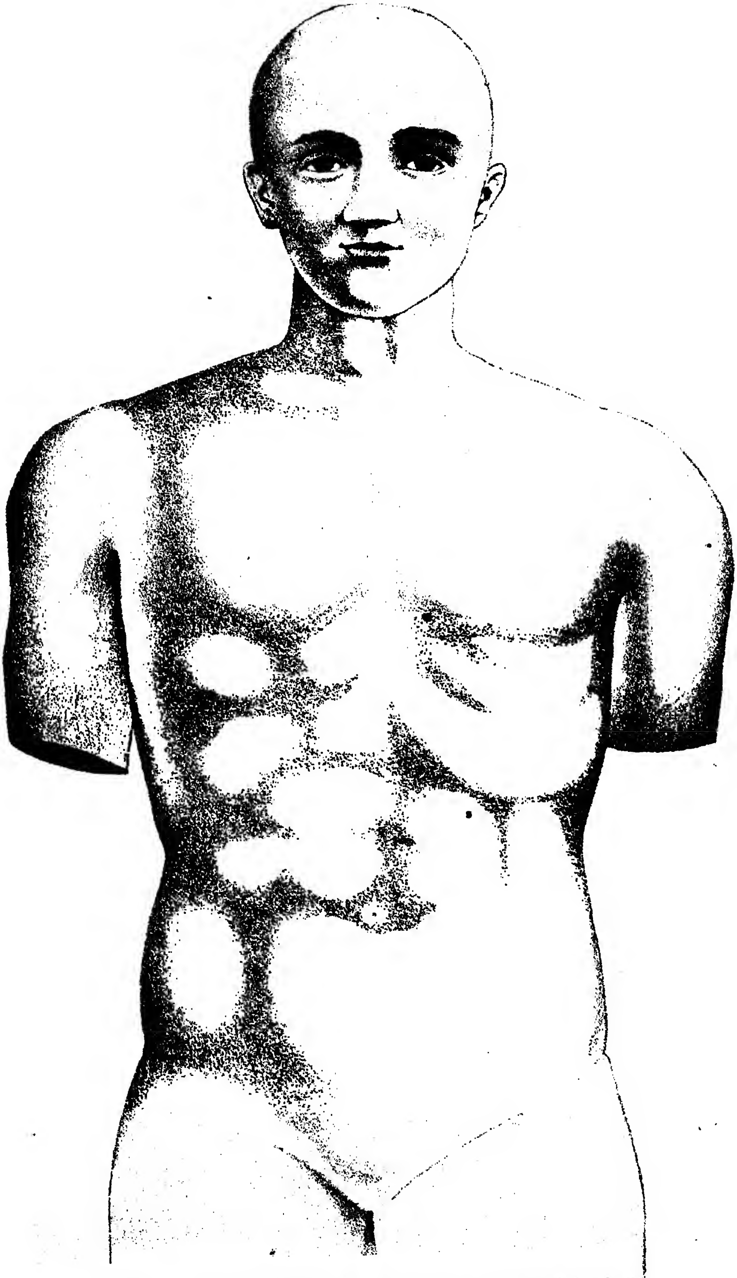
exclusively to the family physician. Much more harm than good results from their domestic use. The design of this book is not to displace the intelligent, careful physician, but to aid him in his philanthropic work, and to displace, so far as possible, the vast amount of worthless medical literature with which mercenary quacks have flooded the land.

The author would acknowledge his great indebtedness for the means of making this work a useful one, if it shall prove to be such, to the long list of eminent medical authorities, too numerous to mention here, whose works have been consulted, and especially to the kindness of the librarian of the great medical library of the Army and Navy Medical Museum, at Washington, D. C., who granted free access to the vast amount of valuable material there collected, embodying all the latest discoveries and improvements in the science and art of medicine up to the present date; and to Mr. Apel, the eminent linguist employed in the office of the surgeon-general as an interpreter and translator, who rendered invaluable aid to the author in his study of the researches of eminent medical authorities of various European countries.

This volume is now committed to those into whose hands it may fall, with the belief that whatever of merit it possesses will be duly recognized and appreciated, and the hope that its faults will be faithfully pointed out for correction in future editions.

THE AUTHOR.

BATTLE CREEK, MICH., AUG. 23, 1880.



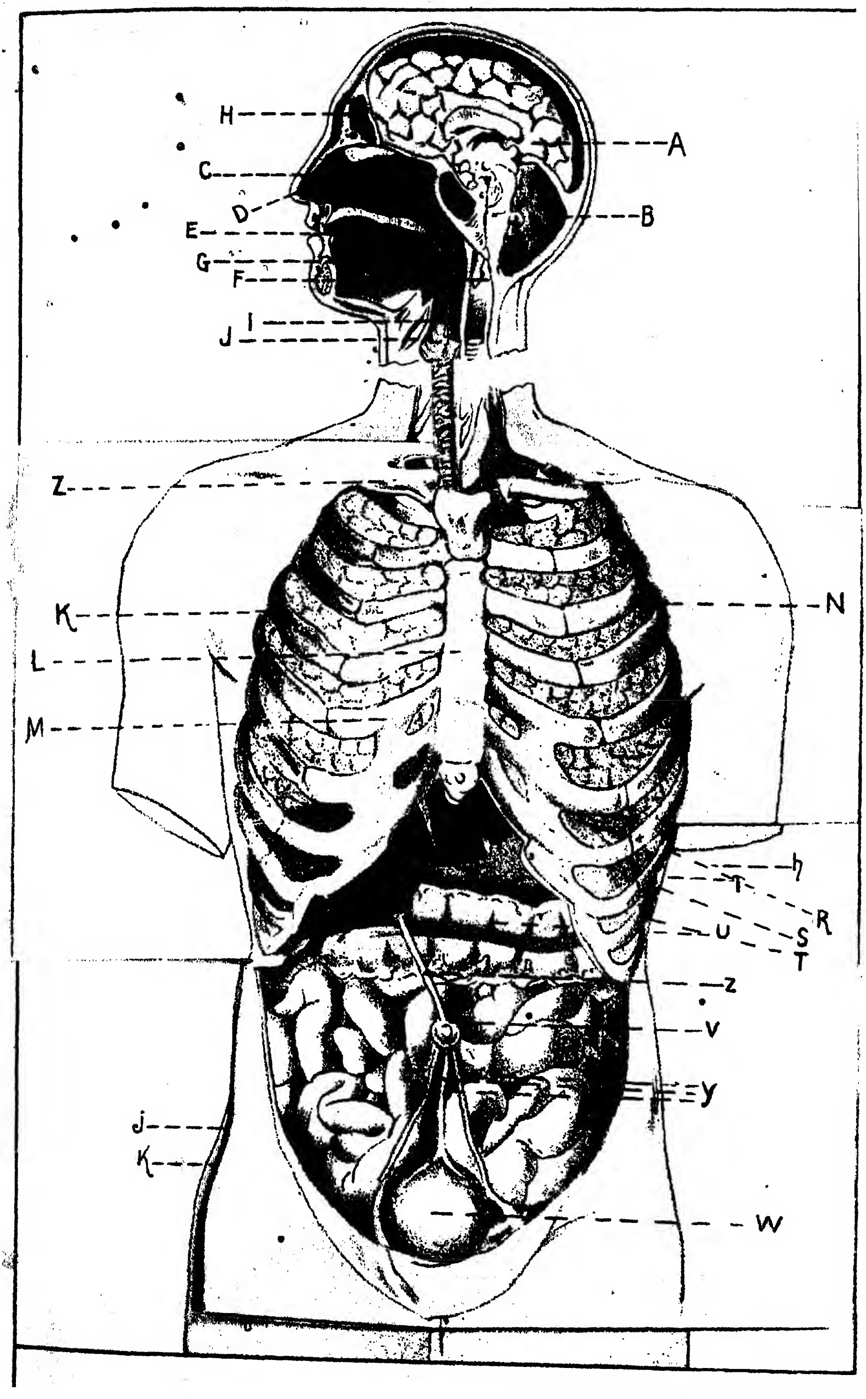
DISSECTED PLATE OF THE HUMAN BODY.

Printed in U. S. A.

INDEX TO DISSECTED PLATE.

A. Cerebrum, or Large Brain.
B. Cerebellum, or Little Brain.
C. Nasal Fossa.
D. Anterior Nares.
E. Posterior Nares.
F. Pharynx.
G. Tongue.
H. Frontal Sinus.
I. Epiglottis.
J. Œsophagus, or Meat Pipe.
K. Ribs Forming the Thorax.
L. Sternum.
M. Cartilages.
NN. Lungs.
O. Trachea and Bronchial Tubes.
P. Liver.
Q. Gall Duct.
R. Stomach.
S. Pylorus.
T. Duodenum.
U. Colon.
V. Small Intestines.
W. Bladder.
X. Spleen.
Y. Pancreas.

a. Descending Vena Cava.
b. Aorta.
cd. Pulmonary Arteries.
e. Pulmonary Veins.
f. Heart.
g. Ascending Vena Cava.
hh. Kidneys.
i. Abdominal Aorta.
jj. Fallopian Tubes.
kk. Ovaries.
l. Uterus, or Womb.
m. Mouth of Womb, or Os Uteri.
n. Inner Extremity of Vagina.
yz. Remains of Fœtal Circulation.


H
A
C
D
B
E
G
F
I
J
Z
K
N
L
M
h
T
R
U
S
T
z
V
y
j
K
W

CONTENTS.

ANATOMY, PHYSIOLOGY, AND HYGIENE.

FOOD AND DIET.

WATER: ITS USES, AND DANGERS FROM CONTAMINATION.

STIMULANTS AND NARCOTICS.

HYGIENE OF THE AIR.

RATIONAL REMEDIES FOR DISEASE.

DISEASES AND THEIR TREATMENT.

SURGERY.

APPENDIX.

LIST OF ILLUSTRATIONS.

APPENDIX.

LIST OF PLATES.

ANATOMY, PHYSIOLOGY, AND HYGIENE.

Definitions.—*Anatomy* is derived from two Greek words which literally signify *to cut*, or *dissect*. The word is used to designate the study of the form, structure, and other apparent properties of organized bodies, whether animal or vegetable. In our use of the word it will be confined to the study of the human form. *Comparative anatomy* is the study of each separate organ of an animal as compared with corresponding organs in other animals; this is one of the most fascinating and instructive branches of science. Our space will not allow of the extended study of this division of anatomy, but we shall call attention to some of the more interesting and important points connected with the subject.

Physiology is a term derived from two Greek words which literally mean a description of nature. When first coined by the ancient Greeks the word meant essentially the same as does the term *physics* at the present day. The philosophers of ancient Greece led their pupils about among the fields, through forests, and beside the lakes and rivers of that picturesque country, discoursing of the various animals, plants, rocks, and other natural objects which attracted their attention. This was a literal study of nature, and the study was called physiology. The term is now used to denote the science of the functions of living creatures. We have *vegetable physiology* as well as *animal* and *human physiology*. There is also *comparative physiology*, the complement of comparative anatomy, already defined, which relates to the comparative study of the functions of various animals.

Hygiene is a word taken directly from the French language. It is used to signify the study of those laws which relate to the healthy action of the various organs of the body. It is one of the most important and practical of all the subjects with which we have to deal, and will receive a proportionate amount of attention, both in connection with the study of the anatomy and physiology of the several organs of the body, and in chapters especially devoted to the subject.

Man's Place in Nature.—Much has been said of late regarding man's place in nature, the general drift of the discussion of the subject being to show that man is but the final product of a process of development which in the course of some millions of ages has raised him from a mere speck of dust to his present position at the head of all animate objects which come within the scope of our knowledge. It is not in this sense that we wish to speak of man's position in the universe. We wish to direct the reader's attention to the following facts:—

1. That man is a part of the material universe. Whatever theory may be held respecting his nature, whether it is partly material and partly spiritual, being double, or whether wholly spiritual as affirmed by some or wholly material as claimed by others, it is generally conceded that *science* recognizes man only as a material object, a part of the great universe of matter, wonderfully complex in his constitution and organized with the most marvelous delicacy, yet no less a part of the world of matter which appears on every hand in such wondrous diversity of forms.

2. That man is subject to the same general laws which govern other material objects. The same destructive agents which effect nearly all the changes in matter, fire, water, gases, and various chemical agents, operate upon man as upon other material objects. The law of gravitation holds him to the earth in precisely the same manner as though he were a stone. Electricity, that most potent of all the subtle, unseen agencies of nature, operates upon man as upon other objects, animate or inanimate, using him as a conductor when no more easy passage is at hand, utterly disregarding his presence or existence when a more facile route is offered. So with all the agencies and forces of nature.

3. That the special laws which govern all organized bodies relate to man in common with all other animals and vegetables. It will be clearly seen by our future study of the human constitution that man is but a part of the general scheme of organization which includes all animal and vegetable life. Man is not a vegetable, but possesses many things in common with the lowest forms of vegetable life, even the microscopic mold which vegetates upon a stale fragment of bread.

The Constitution of Matter.—In order for us to fully understand the varied relations of the human form divine to the rest of the universe, we must first study physiology in its broad, original

meaning; that is, we must study nature as a whole sufficiently to gain a knowledge of the great general laws which lie at the foundation of all existence, animate or inanimate. By this study we shall discover that a senseless, lifeless stone may rightfully claim kinship with a king upon his throne. We shall learn that there is a common brotherhood existing between all material things. Nor will this knowledge, as some might fear, in any degree detract from the dignity of man, the lord of creation, though it will add to the dignity of many objects which we are, through the influence of early erroneous education, inclined to look down upon.

Before entering upon a more precise account of the nature and constitution of matter, we must premise a few points with which we are sure all candid, thinking persons will agree.

1. We possess very little positive knowledge on any subject. Whenever we attempt to get back to fundamental propositions, we find that nearly all our reasoning is based upon assumptions.

2. Nevertheless we must have something as a starting-point in all lines of thought or reasoning; and in the absence of absolute or positive knowledge, the only proper course left for us to pursue is to assume that which is *the most probable.*

3. That which all will agree in accepting as the most probable is that which presents the most evidence in its favor, even though none of the evidence may be absolutely conclusive.

4. The various organs of sense are our only means of receiving knowledge; hence we must accept the evidence of the senses, weighed by reason, as to what is most probable.

Matter the Basis of Existence.—Viewing the subject in the light of the propositions stated, we are shut up to the conclusion that *matter is the basis of all existence.* We do not affirm that there is no other than material existence. We know that there must be, since ideas, qualities, and all abstract things exist, though immaterial; but still, science recognizes matter as the basis of all, since abstract existence is only possible through the relation of abstract to concrete things. To illustrate, sweetness cannot exist independent of some sweet thing, and depends for its existence upon that object. So with all other properties, qualities, and relations. Science does not deny the existence of other than material entities, but does declare its inability to recognize them, since it can deal only with material things, which must be evident to all when it is recollected that man possesses

only seven senses, none of which are capable of recognizing any other than material objects. Any knowledge of immaterial objects must be obtained elsewhere than through scientific investigation. In this, all scientists are agreed.

The Nature of Matter.—All the evidence we have on this subject points to the conclusion that all material things are composed of infinitely small particles which are indivisible, and which possess certain properties common to all forms of matter. For instance, we will suppose that we take a rock and grind it into an impalpable powder. Now we will take as small a quantity of this dust as will adhere to the point of a pin. Placing it upon a perfectly clean slip of glass, we will look at it with a powerful microscope. The invisible particles now appear each like a great rock rivaling in proportions the original mass. Now, by means of delicate appliances, we will divide one of these portions into particles so fine as to be invisible even with the microscope employed. A much more powerful instrument still brings them into view. Another subdivision by chemical means places the particles beyond the power of any microscope, yet the spectroscope will still discover their presence, so that we know they are not lost. So far as our knowledge goes, no further subdivision can be made, and the ultimate, invisible particles are known as atoms.

Atoms do not exist separately, but are combined in groups, which are known as molecules.

The size of atoms cannot be accurately known; but it has been determined within certain limits by calculations based on very probable data, the results of which seem to show that if an apple were magnified to the size of the earth, the atoms which compose it would be not larger than cricket balls nor smaller than fine shot.

Force and Atoms.—A mischievous doctrine has been taught from early ages down to the present time respecting the nature of force and its relations to matter and material objects. The ancient and popular view has been that force is a separately existing something which operates upon matter and material objects, producing all the various changes and operations observable in matter. Science has in modern times thoroughly exposed the fallacy of this theory. What evidence we have on this subject goes to establish the view that force is but a property of matter, and that it is inseparably connected with matter. That matter and force are inseparable is quite patent when we attempt to conceive of either one as existing alone. Such a conception

is as impossible as the formation of an idea concerning a thing which is utterly devoid of properties.

We do not need to trouble ourselves with the various theories respecting the exact nature of atoms, since the general principles laid down hold equally good with all. Whether atoms are hard, indivisible particles, or whether they are something different, does not matter, since we do know that they possess certain definite properties, many of which have been determined. It may be, indeed, that, as not a few eminent philosophers have supposed, there is but one fundamental atom and one primary force; still, our reasoning holds good.

Organization.—As matter is the basis of material existence, so organization is the basis of life in its great diversity of forms. This question has been the subject of an almost endless amount of discussion, which we shall not attempt to review here. We will simply state as before, and we do so without fear of successful contradiction, that what evidence we have on the subject leads directly and irresistibly to the conclusion that life is the result of organization, being the manifestation of the forces of nature connected with matter, modified by a peculiar arrangement. This special arrangement, which occasions the peculiar manifestations constituting the phenomena of life, is what is known as organization. All that makes a plant different from the soil out of which it grows, and the air and water which nourish it, is the peculiar arrangement given to the various elements which are taken in from the surroundings of the plant. The organization of a plant is analogous to the organization of an army or a government, simply an arrangement of the component parts. Each particular plant has its own peculiar arrangement, just as each particular government has its peculiar organization. Destroy the organization, and the life which depended on it is also destroyed. What is true of a plant is also true of an animal, and of a human being.

The ultimate source of all energy is to be found only in the divine Power which created and upholds the stars in their courses, and is at work in the chemical, physical, and vital activities about us and in us,— the infinite Intelligence which "is in all and is all."

Lowest Forms of Life.—A little speck of scum from a stagnant pool or a drop of slime from a moist rock by the sea-shore, when viewed with a good microscope, is seen to be almost wholly made up of minute living organisms. Stagnant water always teems with these low forms of life. In some localities the bottom of the sea is covered

with them. Some of the simplest forms of these minute organisms are mere specks of life which do not differ much in appearance from particles of dust. Indeed, eminent observers have not infrequently confounded these curious little living atoms with inanimate dust. A close inspection, however, shows that they possess some very different properties from dust particles; in other words, that they are alive. Other forms appear like little drops of jelly. Round, transparent, they might be easily mistaken for bubbles or masses of some gelatinous substance were it not that now and then they will be seen to move. If watched closely, it will be observed that they change their form and position, and even eat. They possess no eyes, no mouth, no teeth, no organs of locomotion, in fact are nothing, apparently, but tiny jelly drops; and yet they seem to be conscious, they move about from place to place, and feed upon the little particles with which they come in contact.

Here is life in its most lowly form. It is not hard to think that these tiny creatures, so like the inanimate particles with which we are familiar in the study of chemistry and physics, are but unique arrangements of the same matter which in other forms obeys the well-known laws of matter in its simplest forms.

The Basis of Life.—The little jelly drop sustains to higher organisms the same relation that the atom does to all other forms of matter. It is the basis of life. *Protoplasm* is the technical term which scientists apply to the atom of living forms. Out of these simple forms of life all higher and more complex organisms are formed. This is true of animals as well as vegetables. Take a man in pieces, and he will be found to be made of similar masses connected together by various devices. Dissect a tree, and the same will be found to hold true. Examine a drop of blood with a microscope, and it will be seen that the blood is simply a stream in which are floating, developing, moving, and working, millions of little creatures so nearly like the microscopic creatures found in the scum of a stagnant pool that they have received the same name. The arteries and veins of the body may be looked upon as corresponding to the rivers and streams of a continent, and the blood corpuscles to the fish which swim in the waters.

The Scale of Being.—Man must be looked upon as a part of the great world of life. He is not a distinct and wholly unique creation, totally unlike all other living forms. The little mass of protoplasm

which floats in a drop of stagnant water is at one end of the scale of being, and man, with his magnificent and wonderfully complicated mechanism stands at the other. The two are connected by an unbroken chain of living forms which rise in complexity and superiority in regular gradations from the living atom in the speck of green scum to the human form divine at the summit of the scale.

The scale of life includes all living forms, not simply animals, as might be easily supposed. In all, protoplasm remains the same, always apparently identical, yet sufficiently different to give to the forms of life which it helps to constitute, individuality of existence and characteristic properties.

How Protoplasm Works.—See Figs. 1 to 8. There is nothing more interesting in all the realm of science than to watch with a microscope the operations of protoplasm. Let us study this wonderful phenomenon for a few minutes. In anticipation of wanting material for such a study, a few weeks ago we pulled a handful of grass from the lawn in front of our office, and placing it in a platter half filled with water, put it in a warm place. Now we bring out the platter and find that the grass has undergone partial decomposition. With a glass tube we draw up a few drops of the dirty-looking fluid in which the half-decomposed grass is submerged, and placing a single tiny drop upon a clean slip of glass we put it in the focus of a powerful microscope. Adjusting the glass and the light perfectly, we soon see sundry shreds of brown grass, and numerous floating particles of dust and other foreign matter of no particular interest. If we had not sought a similar view many times before, we should soon put aside the instrument and turn our attention to something more attractive; but we have learned to look a little sharper, and now we are rewarded by seeing just what we were in search of, curious little round masses so transparent as to be almost invisible. They are not very numerous, but scattered here and there about the field. Presently we perceive that some are changing their form. A moment ago the first one we inspected was as round as a watch crystal; now it has become elliptical in form. A few minutes later we look again, and it has stretched itself out into a long filament like an angle-worm. Presently it begins to draw itself up into a round mass again; and before we can write it, it has assumed its original shape, but has changed its position. That is the way the little creature moves about. It makes itself into the shape of a worm and then crawls just as a worm does, by making one end

fast and drawing the rest of the body up. But what does it move about for? Why may it not remain stationary? Shortly we shall see, if we watch carefully. Even now the reason is evident. Reader, just peep over our shoulder a moment. Put your eye down to the eye-piece of our microscope. Do you see the little fellow? Look sharp, and you will. A few seconds ago it was round as a full moon. Now there is a little pocket in one side. The pocket is growing

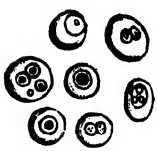


Fig. 1.

Fig. 2.

Fig. 3.

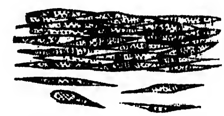


Fig. 4.

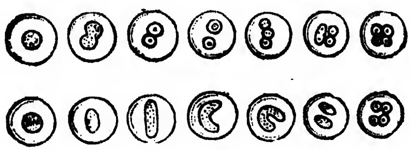


Fig. 5.

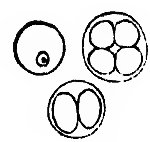


Fig. 6.

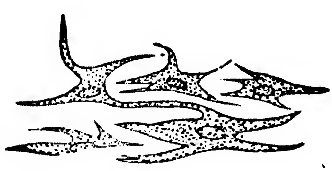


Fig. 7.

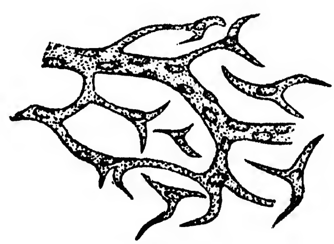


Fig. 8.

Figs. 1 and **5** represent cells in different stages of development. The dark bodies occupying the centers are nuclei.

Figs. 2, 3, and **4** show different varieties of cells.

Figs. 5, 6, and **7,** show how cells divide or multiply.

Fig. 8 is a representation of the manner in which cells unite by their arms to form capillary vessels.

deeper and deeper. What is the object of such a curious procedure? Let us put on another eye-piece. Now we have magnified the object a million times. See how much larger it looks. Now look at the pocket. The mystery is solved. There is a little speck of food which the little creature wishes to get, and so he has made a pocket to put it in. The queerest part is to come yet, so we must watch patiently a moment more. Now the mouth of the pocket is closing up. Evidently the little fellow is afraid he may lose the precious morsel, and

so he is going to shut the pocket to prevent its escape. Now the opening is closed, and before we are aware of it, the pocket itself has disappeared, and there is the little particle inside. This seems a miraculous process, but it is the peculiar way these little creatures have of taking food. When they wish to eat, they make a mouth or a stomach on purpose. If we wait a few minutes, we shall see that the little particle taken in has disappeared. It has been digested. Thus the lowest forms of life can perform some of the same functions which higher animals and vegetables perform, but by much simpler processes.

The smaller living creatures are, the more remarkable seem to be their powers. As we become better acquainted with protoplasm, it does not seem so strange after all that it should be capable of making a plant, painting a flower, building a tree, or even of forming a man; and that is just what it does. How, we shall see further on when we study the various tissues of the body. Let us now consider some of the principal differences between inorganic and organized, or living, matter.

Differences between Inorganic and Organized Matter.—Matter that does not manifest life in any form is called inorganic; living matter is said to be organized, because life depends upon organization. The following table exhibits the principal differences between these two forms of matter:—

INORGANIC MATTER.	ORGANIZED MATTER.
1. Not alive.	Alive.
2. Usually has angular outlines.	Characterized by rounded forms.
3. Has a crystalline structure.	Has a cellular structure.
4. Grows by accretion.	Grows by assimilation.
5. Does not reproduce itself.	Reproduces itself.
6. Does not ferment or decay.	Ferments or decays.

1. Inorganic matter, such as sand, rocks, and all forms of mineral, earthy, and gaseous bodies and chemical compounds, never exhibit the peculiar phenomena which are commonly known as life. These phenomena are confined wholly to plants and animals.

2. Nearly all inorganic objects, unless artificially modified in form, have angular outlines, being usually bounded by straight lines. Organized bodies are bounded by curved and graceful outlines.

3. Most inorganic bodies are crystalline in structure, or are made up of particles which at some time have been crystals. Organized bodies, on the other hand, are generally composed of cells. A cell

consists of a mass of protoplasm, which is sometimes surrounded by a thin wall.

4. Inorganic bodies grow by accretion, that is, by additions to the outside, of matter of the same kind. The increase in size of a snow-ball is a good illustration of growth by accretion. Organized bodies, on the contrary, grow by assimilation, that is, by taking into themselves, from the outside, matter of an unlike character and making it into their own kind of tissue. Thus, a plant grows by taking in food through its roots and leaves; an animal, by taking food into its stomach, assimilation taking place in both.

5. Reproduction is a process wholly peculiar to organized beings. Stones never reproduce their kind. All organized bodies possess the power to create new beings like themselves. Reproduction is really a process of creation, and as such is the most wonderful of all the phenomena of life.

6. Fermentation and decay are processes by which a living organism returns to the inorganic state, which is commonly known as death. As inorganic bodies do not possess life, of course they cannot lose it.

The classification of all objects into inorganic and organized is not strictly correct, since this division does not include a peculiar class of substances not strictly belonging to either of the two mentioned, since they possess some of the properties of each. These substances may be distinguished as organic. They are not organized, since they have not a cellular structure, and are often crystalline; yet they are manifestly not wholly inorganic, since they are subject to fermentation. Sugar, starch, fat, albumen, and sundry other substances which are generally known as proximate elements, belong to this class.

Animals and Vegetables.—If we should scrape from the surface of an old watering-trough some of the slime which is commonly found in such places, and submit it to examination with the microscope, we should find it to be composed almost wholly of living creatures of almost every imaginable form, possessing wonderful activity, and going through the various processes of life common to higher orders of living beings. Should the question be asked, Are these curious organisms animals or vegetables? we might find it more difficult to answer than would be at first imagined. Very likely we should at first call them all animals, since they appear to be swimming about, seemingly possessing volition as distinctly developed as in fishes, birds and larger animals. But a more careful study of the subject would

show us our mistake. The general ideas regarding the distinctions between animals and vegetables hold good only regarding the higher orders of animals and vegetables. In the lower orders nearly all of these distinctions disappear. For example, it is generally supposed that animals alone possess the power of locomotion, vegetables remaining stationary wherever they happen to begin their growth. This is not true with the lower orders, as microscopic vegetables move about in the water as freely, and apparently with as much volitionary power, as animals. These minute plants are indeed actually provided with organs for swimming or otherwise propelling themselves in the water. The same discrepancy is found respecting the other distinctions formerly laid down. The difference between the two classes is, in fact, finally narrowed down to a mere question of diet. If carefully watched, the various minute organisms under observation will be seen to take different kinds of food. Individuals of one class draw nutriment from the inorganic matters held in solution in the fluid in which they float; those of the other subsist upon solid particles of organized matter, perhaps even indulging in an occasional meal upon creatures of their own kind. Here is the primary distinction which, with a single exception, holds good with all the various species of animals and vegetables: vegetables feed upon inorganic matter, animals upon organized matter. There is no exception to this rule among animals; but among vegetables there is the one exception of the class of cryptogamous plants known as *fungi*, which subsist upon organic and organized matter instead of inorganic.

Distinctions between Man and Beast.—Man is an animal, but is not a beast; at least he should not be a beast, though some men will insist on placing themselves on a level with the brute creation. Man stands at the head of the animal kingdom, the lord of all animate creatures, but not above and outside of the great family of animal existence. Although man is an animal, and as such is related to all the lower orders of animal life, yet he possesses faculties and powers which are not only superior in degree, but some which are totally different in kind from any enjoyed by the lower orders. In order that we may correctly understand man's relation to the rest of the animate creation, we must consider the difference between him and lower animals. Without giving attention to minor points, the following may be stated as the most prominent features of difference:—

1. Man has a chin; the beast has none.

2. Man stands erect; no beast naturally assumes the erect position.

3. Man has a conscience, the expression of his moral organs; the beast has none, not possessing moral faculties.

1. The anatomical difference mentioned, the fact that man has a chin while no lower animal has, is an interesting fact, especially when considered in connection with the fact that idiots who are born such usually have retreating chins. Indeed, all the examples of this class we have ever seen presented so slight a prominence of the inferior maxilla that they could scarcely be said to possess a chin. It must not be supposed, however, that it is possible to determine a person's mental capacity by the size of his chin, although the chin is undoubtedly a valuable index to character.

2. There are animals which naturally progress upon two legs only, as birds and some few other animals. Monkeys and various quadrupeds have been trained to walk upon two limbs; but in none of these instances is the erect attitude assumed. Indeed, the anatomical structure of all animals below man in the scale of being is such that the erect position is not only unnatural but impossible.

3. By far the most important distinction between man and his inferior relatives is the third difference noted, that which relates to the conscience. The old distinction that man has reason, while the beast has only instinct, will not at the present day stand the test of logical criticism. Scientific investigations have shown that the beast has reason as well as man. Indeed, it may be readily shown that man possesses instinct, though in less degree than the brute. The fact is now well established that both man and beast have both reason and instinct, reason predominating in man, and instinct in the beast. The real intellectual distinction is, as before remarked, that man has a conscience while the beast has not, being devoid of moral organs.

The objection will be offered to this view, that dogs and some other of the higher animals sometimes show a knowledge of right and wrong. This leads necessarily to the consideration of the question,—

What is Right, and What is Wrong?—Undoubtedly conscience is the recognition of right and of wrong. If we can determine what is right and what is wrong, we shall then be able to decide what conscience is. Probably no better definition for right can be framed than the simple one, "obedience to law." Wrong is manifestly the reverse. Conscience, then, involves the recognition of a law, and also the recognition of the obligation to obey that law. No

brute has the power to do this. If he possessed a sufficiently high degree of intelligence to enable him to recognize the existence of law, which he does not, he has no conscience to inform him of his duty to obey that law. It is for this reason that a brute is not morally responsible. If he possessed moral faculties, he would be morally responsible as much as is man. A man is responsible to the laws of digestion, because he has an organ of digestion. A beast is subject to the same laws, and for the same reason. Man is morally responsible because he has moral faculties. The beast cannot be morally responsible, because he does not possess moral faculties. The seeming exhibitions of knowledge of right and wrong on the part of dogs and other lower animals, on careful examination will prove in every case to be prompted by hope of reward or fear of punishment, or some other similar incentive. A dog can be taught to do things very contrary to his nature by appealing to his sense of fear or some other faculty stronger than the one suppressed. There is in this no recognition of obligation to law. The brute classifies actions not as right or wrong, but as what will bring reward or pleasure and what will bring punishment or suffering. Much that passes for conscientiousness among human beings is equally distinct from the exercise of true conscience. True conscience recognizes right and wrong on their own merits without regard for consequences, either rewards or penalties.

The fact that man possesses a will does not make him morally responsible, since lower animals possess a will as well as man. Moral responsibility consists not in the power to *do* right or wrong, but in the power to discriminate between that which is lawful and that which is unlawful. No difference in kind can be shown to exist between the human will and that of brutes, the only difference being one of degree.

Thus it appears that the possession of a conscience or of a moral nature is the true mental characteristic of the human species, and not the power of thought or the possession of will. The importance of the will from a psychologic point of view is found to be far less than has generally been supposed when it is made to appear, as will be seen farther on, that desire, and not the will, is the primary incentive to action.

GENERAL ANATOMY, OR HISTOLOGY.

We must now confine our study more closely to the structure of the human body, and we shall begin where students in their study usually leave off; viz., with the minute elements of which the body is composed, the tissues. All the various vital processes, upon the proper performance of which the life of each individual depends, are performed by the minute tissue elements which we are about to consider, and cannot be understood without a careful study of these elements. Hence it seems to us to be eminently philosophical to begin at the foundation in order that we may secure an accurate knowledge of the subject under investigation.

How a Human Machine is Built.—The human body may be regarded as the most marvelously constructed of all mechanisms. Its parts are far more delicate, and their mutual adjustments infinitely more accurate, than those of the most perfect chronometer ever constructed. In order to understand the structure of this wonderful mechanism, let us go back to the earliest period of its existence. At this time we find the body to be but a mere speck of matter, a single cell, a delicate little mass of jelly-like protoplasm so small that a hundred or two would not measure more than an inch if arranged in a row. Under proper circumstances this little cell grows, expands, and finally subdivides into two, through the operations of the protoplasm which chiefly composes it. The same activity occasions another subdivision, making four cells of the two. Still another division produces eight cells. Thus the processes of growth and division continue until the one original cell has developed into hundreds, even thousands and millions, under the active working of the protoplasm, which is the chief component of the cells and the potent agent in their activities. Development and division still continue while a new process of folding and reduplication is set up, layers of cells being formed, groups and subgroups being set off, which develop into special systems and organs in accordance with the wants of the organism, until by and by the whole complex organism which we call man is developed. Throughout the whole process, protoplasm is the active agent, the skillful workman that builds and fashions and molds the crude material out of which human tissue is made and brought into its final delicate and wondrous harmony and beauty.

Let us now study with greater care the mode of working. The little masses of protoplasm already described are untiring workers. They also work in a great diversity of ways. For instance, a single mass of protoplasm will sometimes build a delicate wall about itself, when it becomes a true cell, being shut up in a tiny house of its own construction. The protoplasmic body may remain in its self-made prison during its whole life, and die there; or through a wonderful property it possesses it may escape from its prison cell by passing directly through the wall, and proceed to build other cells similar to the first, thus building a large number in the course of its lifetime. An army of protoplasmic bodies working in this way may in time construct a huge tree. Indeed, it is in exactly this manner that trees are built.

But protoplasm does not always operate in this way. In animals, particularly, it usually works in a different fashion. Instead of building a wall about itself, it makes fibres, tubes, bands, and a great diversity of other structures, such as are needed in a complicated mechanism like the human organism. The structures thus formed in the construction of the human body are known as *anatomical elements.* These we will now describe.

The Anatomical Elements.—Notwithstanding the great complexity of the human organism, its great variety of structure, and the wonderful diversity of function performed by its different parts, it is wholly made up of a very few simple elementary structures, not more than six or at most seven in number. These may be divided into two classes: 1. Those which possess a very low grade of life, being simply useful in supporting or holding together, or protecting more highly vitalized and more important parts; and, 2. Those possessed of a high degree of vitality, being chiefly composed of protoplasm, and upon which all the activities of the system really depend. The first class consists of the connective tissues, comprising the two varieties of fibrous tissue, adipose tissue, osseous tissue, and cartilaginous tissue; the second class comprises nervous and muscular tissue. We will now proceed to describe each of these tissue elements separately.

White Fibrous Tissue.—Fig. 9. This, the most abundant of all the anatomical elements in the body, when viewed under the microscope is found to be composed of minute fibres varying in thickness from one forty-thousandth ($\frac{1}{40,000}$), to one twelve-thousandth ($\frac{1}{12,000}$), of an inch in diameter, and of varying length. The fibres are white in color, and

wholly inelastic. White fibrous tissue constitutes the chief element of tendons, ligaments, and other parts where firmness is required. This element is also found intimately interwoven with all the other elements of the body, serving to unite them together and give firmness and solidity to the whole.

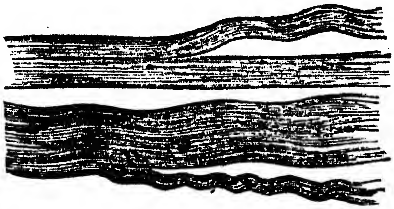


Fig. 9. White Fibrous Tissue.

White fibrous tissue possesses the curious property of being soluble in some acids. Acetic acid will dissolve its fibres and cause them to entirely disappear from view under the microscope.

Yellow Elastic Tissue.—Fig. 10. This tissue is perhaps the next most abundant element, being found in greater or less abundance in all parts of the body. It differs much from white fibrous tissue, its fibres being yellow in color, and very elastic. The fibres instead of being straight are more or less curled and branched, and are much larger than those of white fibrous tissue. Yellow elastic tissue is quite abundant in the skin and all other animal membranes, to which the high degree of elasticity of membranes is due. The *ligamentum nuchæ*, a ligament located at the back of the neck, is composed almost wholly of this tissue. In the ox and other grazing animals this ligament is greatly developed, and serves the animal a very important purpose, holding the head in position without the action of muscles when the animal is not reaching down for its food. In the giraffe this ligament is six feet in length, and possesses such a high degree of elasticity that it is said that it can be stretched to the length of twenty feet.

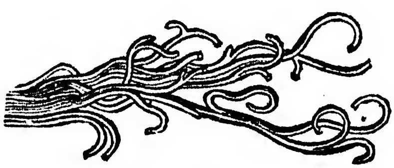


Fig. 10. Yellow Elastic Tissue.

Connective Tissue.—Fig. 11. This tissue is not an anatomical element, being wholly made up of the two former. It constitutes a great share of the bulk of the body, forming, in fact, a framework by which the various parts are held together, and serving to bind together the several elements of which the different organs are composed. The skin and other membranes are almost wholly made up of connective tissue. The white and yellow fibres are in this compound tissue interwoven

together in such a way as to form a fine network with meshes. These interspaces are usually occupied by the fluid part of the blood, which bathes the minute elements of the body in every part, and supplies them with the needed nutriment. It is in these spaces that the lymph channels, the set of vessels which run from all parts of the body toward the center of the circulation, have their beginning. In general dropsy, or œdema, these spaces are distended with serum. Cases sometimes occur in which the spaces become filled with air, as in injuries to the lungs in which the pulmonary cavity is made to communicate with the connective-tissue spaces, when by a sort of pumping action the process of respiration has been known to cause enormous distention of the whole body. Some years ago a couple of unnatural parents were arrested for the most revolting cruelty to a little girl whom they were exhibiting about the country. The child was shown as a monstrosity, its head being distended to enormous proportions. Upon investigation of the case, it was found that the child's scalp had been gradually distended to its unnatural proportions by means of inflation with air through a pipe-stem. It is a well-known practice with butchers to thus distend the connective tissue of sheep in dressing them for the market, by which means they are rendered much more attractive than they would otherwise be.

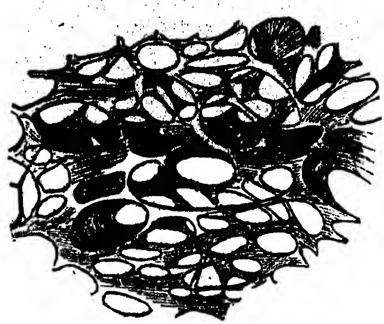


Fig. 11. Connective Tissue, showing spaces produced by drawing the fibers apart.

Adipose Tissue.—Fig. 12. This tissue really consists of connective tissue in which the spaces between the fibres have been filled with fat cells, the size of which is variable, but probably averages about one one-hundred-and-twenty-fifth ($\frac{1}{125}$) of an inch. Adipose tissue is found in greater or less quantities in nearly all parts of the organism, but particularly just beneath the skin,

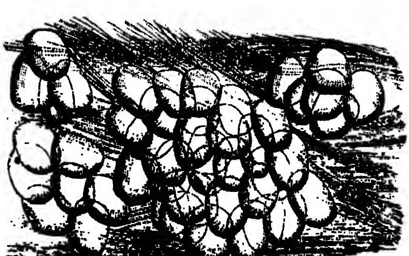


Fig. 12. Adipose Tissue, showing fat cells deposited in the connective-tissue spaces.

where a layer is deposited seemingly as a protection from cold. Adipose tissue is much more abundant in winter than in summer, being then needed much more than in the warmer seasons of the year.

Cartilage Tissue.—This tissue, in its typical form, consists of a homogeneous, structureless base in which are scattered, with a considerable degree of regularity, cavities in which are found cells which during life fill the entire cavity. The structure of this peculiar tissue will be readily seen in Fig. 13. Cartilage is chiefly found in adults at the ends of bones, where a moderate degree of elasticity with very slight sensibility to pressure is required. These properties are admirably supplied in cartilage. In early life the bones are composed of cartilage, the change from cartilage to bone taking place during the period of growth. After complete ossification has taken place, no further development can occur.

Fig. 13. Cartilage Tissue, showing the characteristic cells.

A peculiar kind of cartilage known as fibro-cartilage is found between the vertebræ, and at some other points where there is a very limited degree of motion. Cartilage is in some few instances developed in tendons and even in the skin and other tissues, where it is always more or less intimately blended with connective tissue. In old age, cartilage sometimes undergoes a process of hardening from the deposit of lime, which is known as calcification.

Osseous, or Bony Tissue.—In Figs. 14 and 15 will be seen an excellent representation of the minute structure of bony tissue. The large, irregular canals seen in Fig. 15, and represented by circular openings in Fig. 14, are the blood-vessels of bone, here known as *Haversian canals.* The dark spaces with the lines radiating from them are *lacunæ* and *canaliculi,* together forming the bone corpuscles. Fig. 14 shows very beautifully the admirably systematic arrangement of these corpuscles, and the manner in which they communicate with each other and with the blood channels. The dark spaces are cavities in the bone, and the small lines running out from them represent minute canals by which they are connected. Each cavity is occupied by a

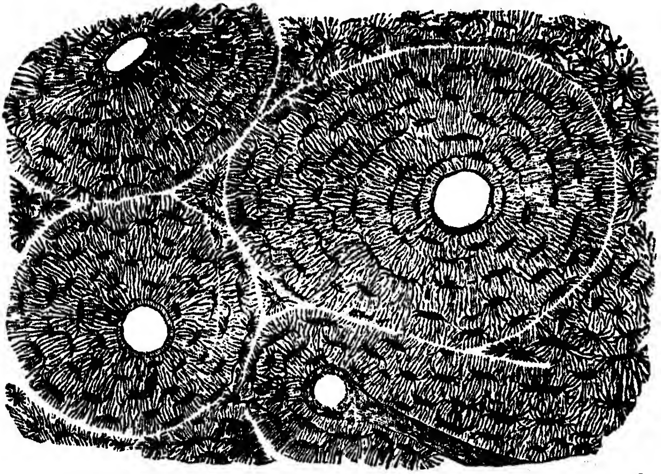


Fig. 14. Transverse section of bone as seen with the microscope.

mass of protoplasm, a cell, which puts out a number of protoplasmic fingers by which it touches other cells near by; and thus the minute creatures which inhabit these little caves in the bone are enabled to communicate with one another through all its parts. The business of these little creatures is to develop the bone and to keep it in good repair. They have charge of the bone-building business of the body, each having its particular little section of bone to look after. The portion of the tissue surrounding the cavities and canals, and forming the great bulk of the tissue, is made up of a curious compound of animal matter with various salts in a partially organized state, the chief of which are phosphate and carbonate of lime. The evidence is that they are in a state of partial organization, a condition which might be termed organic. Some eminent observers say that in very old age the protoplasmic bodies which occupy the cells of bone tissue die, the spaces being then filled with air.

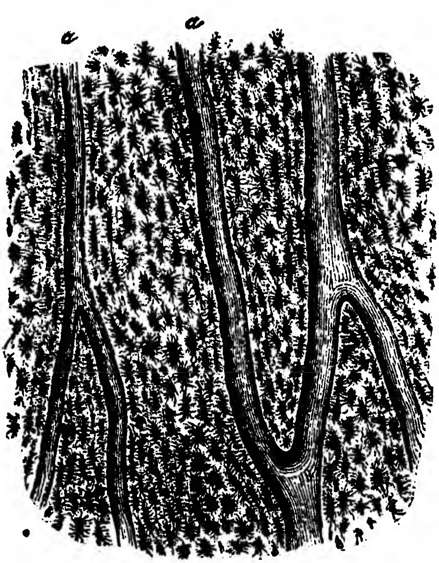


Fig. 15. Magnified view of a longitudinal section of bone; *a a a*, Haversian Canals.

Osseous tissue forms the skeleton of the body, the bony framework

upon which the soft parts are built, together with a portion of the substance of the teeth. In lower animals, bony tissue is also deposited in the skin, the white of the eye, and other soft parts. Very singularly, it also happens in some cases of disease that bony tissue is developed in the soft tissues.

Muscular Tissue.—There are two varieties of muscular tissue. One consists of long, unbranching fibres, marked by transverse lines called *striœ*, the other of short, branching, spindle-shaped fibres which are smooth or *unstriated.* Fig. 16 represents those of the first class, or *striated* muscular fibres, which compose the greater portion of the soft parts of the body, constituting the lean meat of animals. They can be easily seen with a strong microscope, and are very interesting objects of study. This variety is sometimes distinguished from the other by the difference in action, being called *voluntary* muscular tissue because it composes all muscles which are under the immediate control of the will. A striated muscular fibre consists of a tubular sheath containing the active muscular substance, which appears to be divided into minute beaded fibres, although the exact ultimate structure of these primary fibrillæ is not very well understood.

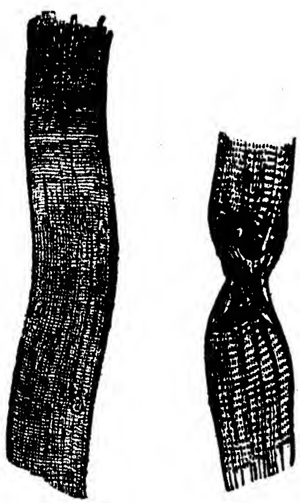


Fig. 16. Voluntary Muscular Tissue, showing smallest fibers with striæ.

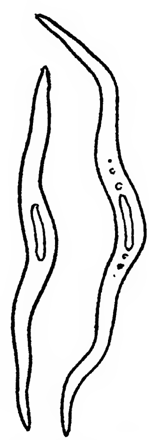


Fig. 17. Involuntary, or non-striated Muscular Fibre.

Non-striated or *involuntary* muscular fibres are found in muscular organs not under control of the will, as the gullet, the stomach, intestines, bladder and urinary passages. The form and simple structure of this kind of tissue are sufficiently well seen in Fig. 17, so

that no further description is necessary. It should be mentioned that the heart, although an involuntary muscle, is composed of a muscular tissue peculiar to itself, its fibres in some respects resembling both voluntary and involuntary muscular fibres. This is probably owing to the physiological fact that voluntary fibres contract with rapidity and vigor, while the contraction of involuntary fibres is slow and less vigorous. However, voluntary muscles soon tire by continuous exercise, while involuntary fibres are capable of maintaining their activity for a long time. The heart admirably combines both properties.

Fig. 18. Nerve Cells, showing prolongations, or poles, three of which are prolonged to form nerve fibres.

Fig. 19. *c.* Nerve Fibre moderately magnified; *a.* Greatly magnified, showing fibrillæ; *b.* Fibrillæ magnified still more, showing beaded appearance.

Nerve Tissue.—This is by all odds the most interesting, and perhaps the most important, of all the anatomical elements. As is the case with muscular tissue, there are two varieties of nerve tissue. These are familiarly known as cells and fibres, the gross distinctions between which may be readily seen by reference to Figs. 18 and 19.

Nerve cells are irregularly shaped bodies of protoplasm, usually provided with one or more arms or projections of the same substance. In the center of the cell may be seen a nucleus, and, usually, within the nucleus another smaller center, called a nucleolus. The branching arms are termed poles. Nerve cells are found chiefly in the brain and spinal cord; but they are also found in groups known as ganglia in various parts of the body. They are the generators of nerve force, and correspond to the batteries used in telegraphy.

Nerve fibres are composed of a bundle of minute fibres, which forms the *axis-cylinder*, invested by a peculiar substance which acts as an insulator. The nerve fibrillæ are minute filaments of protoplasm, being simple prolongations of the protoplasm of nerve cells in the brain and spinal cord. These filaments are continuous from their starting-point in the nerve cells to the part of the body, near or remote, in which they terminate. Thus there is formed a complete network of protoplasmic threads through all parts of the body, connecting every minute portion of the system with the central organ, the brain, much like the network of telegraph wire which may be seen traversing the air in every direction in any large city, connecting its most distant parts with the central office.

When it is understood that all thought, feeling, sensation, and even all motion and vital action of every sort, is dependent upon nerves and nerve cells, it will be granted that we have not overstated the facts in calling this the most important of all the tissues of the body.

Membranes.—Membranes are chiefly made up of connective tissue. They are not anatomical elements, but simple combinations of elements. A membrane consists essentially of a layer of connective tissue which forms the basis, over which are spread several layers of cells, or protoplasmic bodies, called *epithelium*. Besides the skin, which is a form of membrane, there are three other kinds of membrane, *mucous, serous,* and *synovial*. Mucous membranes line cavities which communicate directly with the outside of the body, as the mouth and the whole digestive tract, the air passages, and the urinary cavities and passages. Serous membranes line closed cavities. Synovial membranes partially line the cavities of joints. Each of these several kinds of membrane, including the skin, secretes a fluid peculiar to itself. The skin produces perspiration, or sweat, by means of the sweat glands. Mucous membrane produces mucus, from its mucous follicles. The serous membrane produces a serous fluid; and the synovial membrane secretes a fluid for the lubrication of the joints.

The cells, or epithelium, covering these various membranes, differ very considerably, and also differ on the same kind of membrane in different parts of the body. Some forms of epithelium are exceedingly curious and interesting. For example, a kind known as *ciliated* epithelium is covered with delicate hairs which are kept in constant and rapid motion during the life of the cell. A small section of mu-

cous membrane having this kind of cells, when viewed under a microscope presents the appearance of a field of grain waving in the breeze. Specimens of this kind of cells can be obtained for examination from the air passages or from the mouth of a frog, or, better, from what is termed "the beard" of a live oyster. Fig. 20 exhibits a number of varieties of epithelial cells.

Fig. 20. Specimens of Epithelial Cells of various sorts.

As the other tissues will receive ample consideration in connection with the description of the various organs in which they are found, we will not devote more space here to the subject of general anatomy, or histology, although it is a subject of great interest.

A General View of the Human Mechanism.—Having now viewed quite minutely the anatomical elements, the brick and mortar, so to speak, of the human body, let us briefly glance at this wonderful machine as a whole, before beginning a minute description of its several organs and their functions, as by this means we shall be better able to understand the relations of each part to the whole.

The human body may be considered as a machine constructed for the purpose of thinking, feeling, and acting; at any rate, these three things comprise all the capabilities of any human being. For the performance of these functions there are necessary,—

1. A set of organs capable of thinking and feeling. This we have in the *nervous system.* Certain of the nerve cells of the brain are undoubtedly endowed with the power to think. Their activity is thought. By means of certain accessory apparatus, the organs of sense, which comprise hearing, sight, taste, smell, touch, the sense of weight and the power to distinguish temperature, the thought or mind cells of the brain are able to take cognizance of external things; in other words, to feel or receive sensations. Through the almost infinite ramifications of the delicate nerve fibrillæ already described, all parts of the body are not only made tributary to the brain, but are brought under its domination.

2. There is needed a special set of organs by means of which motions of various sorts can be executed. This want is exactly supplied by the *muscular system,* acting in connection with the bones

and the nervous system. The bones serve as points of attachment for the muscles, by which they are employed as levers. The nervous system furnishes the impulse, and the muscles execute the order by contracting in accordance with the directions given to them through the nerve telegraphic communications from the brain.

If the human machine operated without friction or wear, this would be all we should require to perform all the necessary functions of individual life; but every thought, every sensation, every motion or muscular action, is at the expense of tissue. The vital machinery wears and wastes as do all other mechanisms. This necessitates a constant supply of fresh material, and a system of repair. The new material is supplied by the *circulatory apparatus*, which comprises the heart and the blood-vessels, the chief object of which is to distribute the material for repairs wherever it may be needed throughout the system, the nutrient fluid, the blood, being itself replenished through the *digestive apparatus*, which is specially designed for the purpose. Unlike any machine of human invention or construction, this wonderful mechanism possesses the power, within certain limits, to repair itself and keep its own parts in order. Each particular part possesses the power to repair and renovate itself; and so long as this power remains intact, provided the proper amount of new material is furnished, so long will the machine continue to run.

But our machine is not yet wholly complete. The waste products which result from the wear and tear of the tissues in action must be disposed of. If allowed to remain in the system, they would very soon obstruct the delicate machinery so that proper action would be impossible, and activity would speedily cease. This necessitates a special set of cleansing organs to dispose of waste and worn-out particles. This want is supplied in the *eliminative system*, comprising the lungs, which throw off a pound of gaseous filth every day, the skin, which is almost equally active, the kidneys, the liver, and the bowels. These five active organs are constantly at work removing from the body substances that are of no use, and which will obstruct and retard vital action if retained. The human machine clears itself of obstructions. The blood also plays an important part in this work, since in addition to distributing nutriment where needed, it bathes and washes every tissue free from the obstructions which may have accumulated in or about it and hurries them off to the proper organ which is designed to eliminate or remove them.

As a certain temperature is necessary for the perfect action of this delicate mechanism, nature has so planned that all the various processes named shall result in the production of animal heat, so that this want is supplied at the least possible expense to the vital economy. As uniformity of temperature is also necessary for the proper performance of the various bodily functions, special means are provided by which a deficient supply of heat may be economized and a superabundance rapidly dispersed so as to protect the body from extremes.

So far as the individual man is concerned, the mechanism is now complete; but as the machine ultimately wears out, it is important that there should be some means provided for the perpetuation of the race. This necessity is met by the *reproductive apparatus*, by which new individuals, possessing essentially the same qualities and capable of performing the same functions, may be produced. As we shall elsewhere see, this is one of the most remarkable of all the bodily functions. Indeed, the mysteries of generation are as much beyond the power of the human mind to solve as are the problems which cluster about the origin of all things. In his reproductive function, man approaches nearest to the Creator, though in this he only uses a power delegated to him by the Creator in common with all other living things.

Thus we have complete, in every detail, this marvelous human machine, which stands as an unanswerable argument against all the sophistry that can be invented to sustain atheism, establishing beyond the possibility of cavil that there must have been at some time at work an intelligent power as much superior to the highest type of human power and intellect as this delicate mechanism is above the most ingenious piece of workmanship which the most skilled mechanic has ever produced.

Having taken a general survey of the human system, its various systems of organs and their general functions, let us now look a little more carefully into the details of structure and function, so that by a thorough understanding of the nature of the various parts and organs of the body we may be the better able to understand what means are necessary to preserve them in health and to cure and prevent disease. Our attention is naturally directed to the bones, which, as we have already seen, constitute the framework of the body.

THE BONES

Although the bones are the firmest parts of the system, they are not, as many suppose, possessed of a very small degree of life. Mere lifeless sticks would come far short of performing the functions of bones. While not as highly vitalized as some of the more rapidly changing tissues, they possess sufficient vital activity to enable them to perform their functions and to repair injuries which may occur. All the bones of the body taken together form the skeleton, for a representation of which see Fig. 21 or PLATE I.

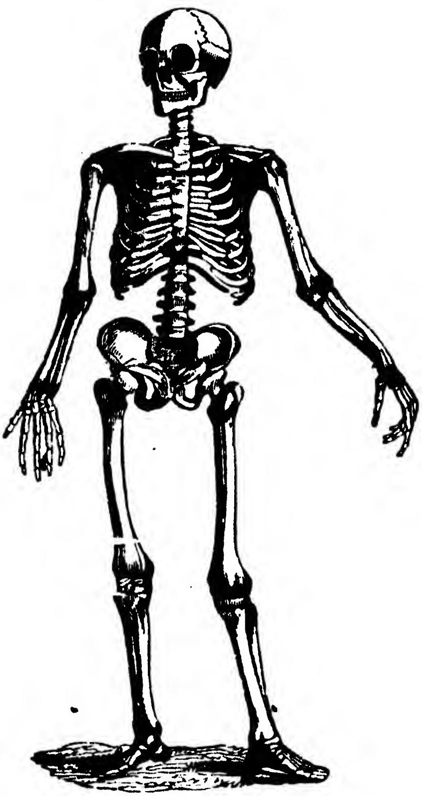
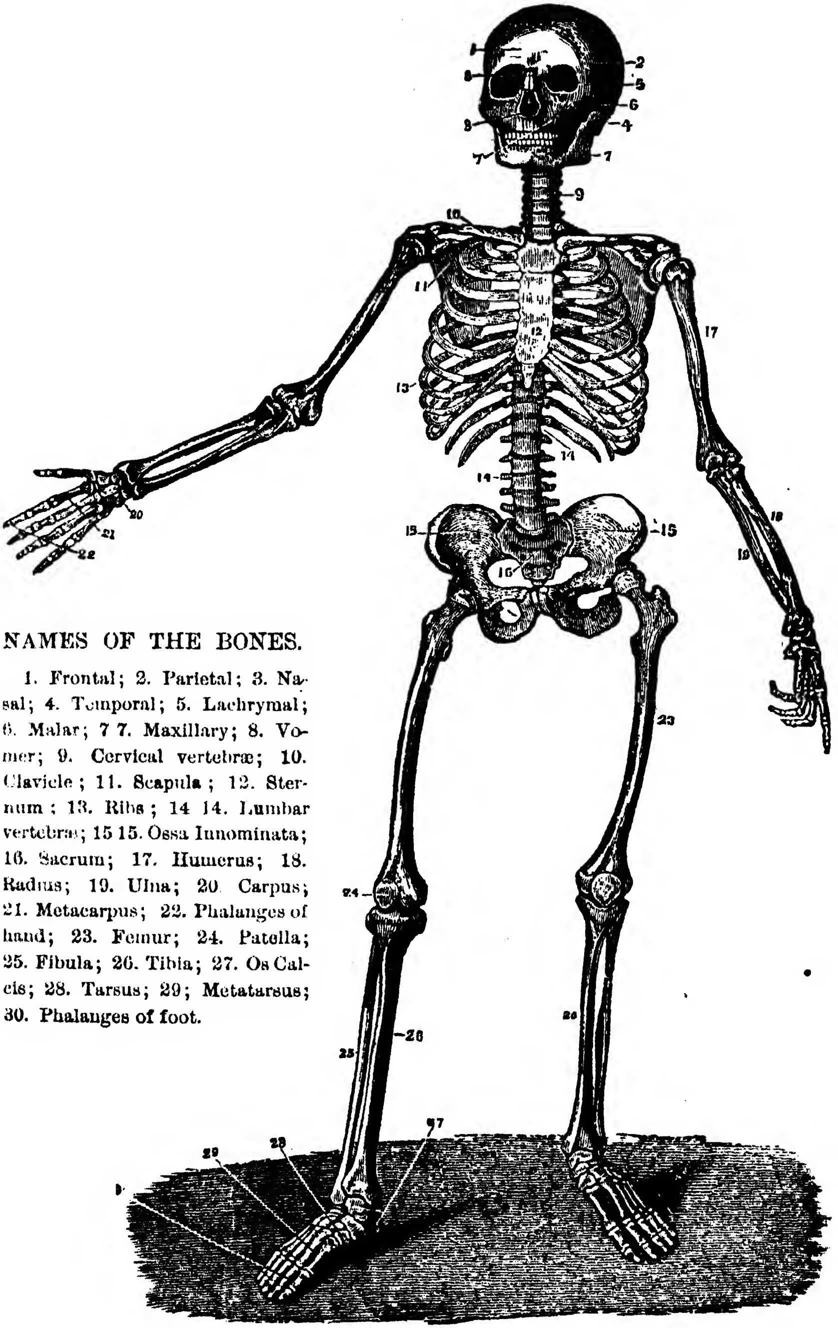


Fig. 21. The Skeleton.

Fig. 22. Portion of a long bone, showing the periosteum slit up and separated from the bone.

Structure of Bones.—Bones are made up of a peculiar structure, which has been already described. The osseous tissue proper is covered over with a tough membrane called the *periosteum*, and commonly known as the whit-leather. Fig. 22. This membrane supplies blood-vessels to the bone, and it is from it that the bone grows. Bones are classified according to their form into long, short, flat, and irregular. Long bones are hollow, having a canal running through a greater or less portion of their length, which is called the *medullary canal.* This canal is lined with a membrane similar to the periosteum,



NAMES OF THE BONES.

1. Frontal; 2. Parietal; 3. Nasal; 4. Temporal; 5. Lachrymal; 6. Malar; 7 7. Maxillary; 8. Vomer; 9. Cervical vertebræ; 10. Clavicle; 11. Scapula; 12. Sternum; 13. Ribs; 14 14. Lumbar vertebræ; 15 15. Ossa Innominata; 16. Sacrum; 17. Humerus; 18. Radius; 19. Ulna; 20. Carpus; 21. Metacarpus; 22. Phalanges of hand; 23. Femur; 24. Patella; 25. Fibula; 26. Tibia; 27. Os Calcis; 28. Tarsus; 29; Metatarsus; 30. Phalanges of foot.

PLATE I.—*THE SKELETON.*

called the *endosteum*, and is filled with medullary substance, which consists of blood-vessels, nerves, fat, and connective tissue. The shaft of long bones is composed of a dense, firm structure, called *compact* tissue, while the expanded ends are chiefly made up of a looser structure, known as *cancellous* tissue. See Fig. 23. Short, flat, and irregular bones are composed of a shell of compact tissue, the interior being spongy in character.

The periosteum and the medullary substance, or marrow, of bone are very important portions of these organs, since injury to either of these parts is quite certain to be followed by death of the bone on account of interference with its nutrition.

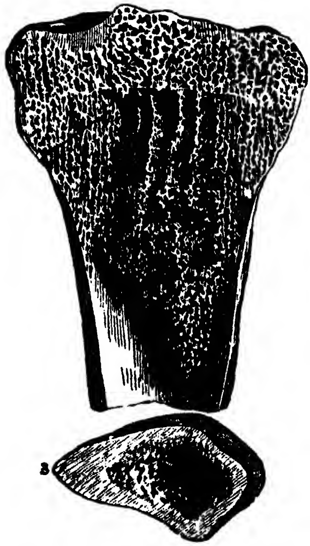


Fig. 23. The upper part of the cut shows a longitudinal section of the large end of a bone. At 3 is to be seen a transverse section of the shaft, showing the medullary canal.

The Joints.—The points at which bones come together are called articulations, or joints. The parts which enter into the formation of joints, in addition to the bones, are cartilage, synovial membrane, and ligaments. Wherever bones come in contact with any degree of motion, the surfaces of contact are covered with a dense, elastic, non-sensitive substance known as cartilage. In order that the bones shall be held together in proper position, they are bound by firm bands of fibrous tissue, called ligaments, which are so arranged as to secure firmness without interfering with the necessary movements of the joint. In order to provide for the maintenance of the joint in a healthy condition, a means is furnished for lubricating the articulating surfaces and thus lessening friction. The lubricating material is known as synovia, and is furnished by the synovial membrane, with which every joint is provided for this purpose.

Varieties of Joints.— A number of different kinds of joints are illustrated in the human body, the most important of which are, the *hinge* joint illustrated by the knee, the elbow, the fingers and toes; the *ball-and-socket* joint, of which the hip and shoulder joints are examples; and the *gliding*, or *planiform* joint, in which one flat surface glides over another, as in the short bones of the wrist and the ankle.

Divisions of the Skeleton.—The skeleton is divided into three parts; viz., the head, the trunk, and the extremities. The number of

bones contained in each of these portions is as follows: The head, 22; the trunk, 52; the extremities, upper and lower, 126; making 200, the whole number of bones in the body.

BONES OF THE HEAD.

Fig. 24. The Skull, showing the sutures, or points of union, between the several bones.

Fig. 25. The Skull, with the bones separated so as to show their shape. 1. Frontal; 2. Parietal; 3. Occipital; 4. Temporal; 5. Nasal; 6. Malar; 7. Superior Maxilla; 8. Lachrymal; 9. Inferior Maxilla. Several bones are not shown.

Of the twenty-two bones forming the head, eight enter into the structure of the skull, or *cranium,* the remaining fourteen forming the face.

The Skull.—The cavity of the skull is designed for the reception and protection of the brain, a purpose to which it is most admirably adapted both by its general shape and its minute structure. Each of the bones of the skull consists of two plates of compact tissue connected by a layer of very spongy tissue called *diploe.* See Fig. 26. This gives to the skull a degree of elasticity which it could not otherwise possess, thus protecting it from fracture, and also serves to deaden the effect of blows upon the head before the force has been transmitted to the delicate brain beneath. The bones of the skull are firmly joined together by means of *sutures,* which in infancy allow of some degree of motion; but as the skull assumes its full size, the sutures become knit together so firmly

as to preclude the possibility of motion. It is owing to this fact that different nations are enabled by different modes of dressing the head to cause it to assume different shapes. For example, certain Indian tribes, by applying a flat surface to the forehead and binding it firmly in place in early infancy, are enabled to produce a permanent flattening of the forehead. A class of the natives of India are noted for the peculiar cone-shaped form of the head, which they produce by a similar process.

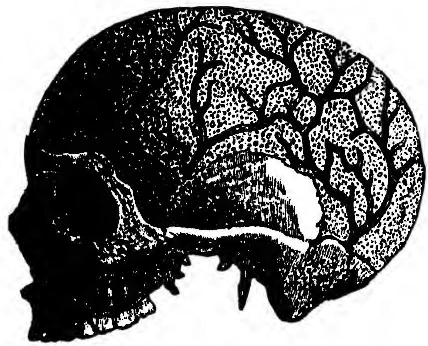


Fig. 26. The Skull with the outer plate removed, showing the diploe and the channels for blood-vessels.

A number of openings are found in the skull, the largest of which, called the *foramen magnum* from its large size, is located in the inferior and back part, and affords a passage for the spinal cord. The numerous other smaller openings are for the passage of blood-vessels and nerves.

The interior of the cranial cavity presents many ridges, depressions, and processes, which correspond with the uneven surface of the brain, which with its membranes exactly fills the cavity.

The names and location of the eight bones forming the skull are, the *occipital,* which forms the whole posterior portion; the two *parietal,* which chiefly form the sides and upper portion; the two *temporal,* situated low down upon the sides; the *frontal,* forming the whole front portion of the skull; the *ethmoid,* which is placed in the lower part of the skull near the root of the nose; and the *sphenoid,* which joins all the other bones together at the base. At birth it is usually the case that the frontal bone is in two parts, it being always formed in this way, the two halves being afterward joined together very early in life. At birth, ossification of the bones of the cranium has not fully taken place, the deficiency being very apparent at two points, one at the anterior portion of the head and the other at the upper and back part. At these points the covering of the brain is so thin that it yields readily to pressure, and the beating of the arteries can be easily felt. On this account, these points are commonly termed "soft spots." The medical term is *fontanelles.* As ossification progresses rapidly after birth, the fontanelles are soon closed up.

The Bones of the Face.—The fourteen bones which form the face are named as follows: two *nasal,* two *lachrymal,* two *malar* or cheek-bones, two *upper maxillary,* two *palate,* two *turbinated* or spongy bones of the nose, the *vomer,* and the *lower maxillary* or under jaw-bone.

The two *nasal* bones form the upper part or bridge of the nose, joining the frontal bone of the skull. They are small bones, and are lengthened out upon the sides of the nose by cartilage.

The two *lachrymal* bones are so called because they contain a small canal which conveys the tears from the eye to the nose. They are situated at the inner corners of the eyes, and join the nasal bones.

The *malar,* or cheek-bones, are situated at the outer and upper part of the face. In some nations, as the Tartars and North American Indians, these bones are very prominent, giving an angular appearance to the features.

The *superior maxillary* bones constitute the greater portion of the face, joining in front beneath the nose. They also form the greater portion of the roof of the mouth, and afford a place for the insertion of the sixteen upper teeth. Each of the maxillary bones has in its upper portion a cavity of considerable size which is lined with mucous membrane, and communicates with the nasal cavity through a small opening. This cavity is known as the *antrum of Highmore.* It often becomes a seat of disease through the formation of abscesses and the production of polypi or other morbid growths, which occasion very great trouble and annoyance on account of the difficulty of gaining access to the diseased part. It is supposed that the object of these cavities is to improve the quality of the voice.

The superior maxillary bones usually unite at birth or soon after, being joined by two small intervening bones called *intermaxillary,* from their position. In case the maxillary and intermaxillary bones fail to unite, a fissure is left which usually extends down through the roof of the mouth as well as through the lip, producing a deformity which from its peculiar resemblance to the lip of a hare is known as hare-lip. When the deformity exists upon both sides, it is known as double hare-lip. The only remedy is a surgical operation.

The *palate* bones are small structures placed at the back part of the mouth, forming the upper part of the roof of the mouth and extending upward to aid in forming a socket for the eye.

The *turbinated,* or spongy, bones are located in the upper part of the

nostrils. They are very spongy in character, and by their scroll shape present an extensive surface for the nasal mucous membrane, in which are located the nerves of smell.

The *vomer* derives its name from its resemblance to a plowshare. It is a thin, flat bone, and forms the septum of the nose.

The *inferior maxillary* bone forms the lower jaw, in connection with the teeth, which it carries in its upper portion. It is a somewhat V-shaped bone, the apex of the angle being in front and forming the chin. The two lateral portions, after extending backward about one-half their length, take a somewhat abrupt turn upward, thus forming what is called the angle of the jaw. The upper ends of the ascending portions are joined by a hinge-like articulation to the skull. The socket of the joint being rather shallow, the bone not infrequently slips out of place in violent yawning or laughing, producing dislocation. The manner of remedying this difficulty will be fully described in the proper place.

The length of the jaw gradually increases with the growth of other parts of the body, additional teeth being produced at the back part as there is room for them, so that in adult life we find sixteen full-sized teeth, whereas in childhood there are but ten small ones. The teeth are placed in sockets provided for them by the *alveolar processes*. When the teeth fall out, from disease or old age, the processes are usually absorbed. It is this which occasions the peculiar prominence of the chin noticeable in elderly persons.

The form and location of most of the bones of the face and skull will be better seen in Figs. 24 and 25 than they can be described.

The teeth will be fully described in connection with the organs of digestion.

BONES OF THE TRUNK.

The bones of the trunk consist of the *vertebræ*, the *ribs*, the *sternum*, and the *pelvis*.

The Vertebræ.—Fig. 27. These bones are twenty-four in number, and are arranged one above another, forming a bony column called the vertebral, or spinal column, which is the central axis of the body. Each vertebra (Fig. 28) is an irregularly shaped bone, the larger portion of which, called the body, is concave behind, convex in front, and nearly flat on its upper and lower surfaces. Projecting from the back side of the body is a bony arch which has at the center behind a more or less distinct prominence known as the

spine of the vertebra, or the spinous process. There are various other projections from the sides of the body and arch, which serve as means for joining the vertebræ together and for the attachment of muscles. There is also noticeable a notch at the junction of the body and the arch on either side of the vertebræ, both above and below in most cases. When the vertebræ are arranged one above another in the spinal column, the bodies form a bony pillar, while the arches, being placed one above another, form a bony canal for the spinal cord. The notches before mentioned, being also superimposed one above another, form lateral open-

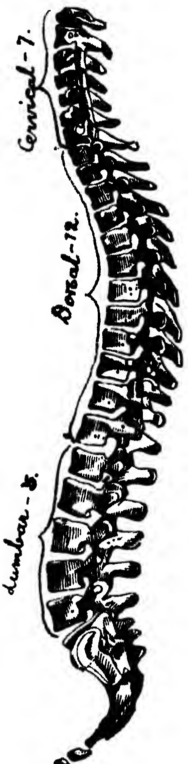


Fig. 27. The spinal, or vertebral column.

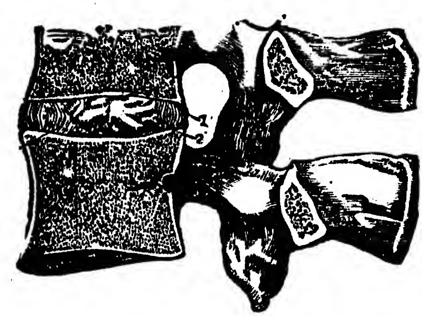


Fig. 28. A vertical section of two contiguous Vertebræ, showing the spongy structure of the bodies, and the Fibro-Cartilage between them.

ings through which the spinal nerves and blood-vessels may pass. Between each two vertebræ are placed discs of *fibro-cartilage,* the use of which will be seen farther on.

The vertebræ of the spinal column are divided into three portions: the *cervical,* or neck portion, comprising the first seven, which form the neck, supporting the head; the *dorsal,* or back portion, which are connected with the ribs, consisting of twelve vertebræ; and the *lumbar* portion, the remaining five, comprising the vertebræ of the loins.

Each of these three classes of vertebræ possesses certain special characteristics by which they may be known; but as most of these are of merely anatomical interest, we will not stop to consider them, only noticing the interesting peculiarities of the first two vertebræ of the neck, those next the skull. The first vertebra, called the *atlas*

(Fig. 29), instead of having a body, arch, and various processes, is simply a ring of bone made to fit the under part of the head, surrounding the foramen magnum. The articulation of this bone with the head is such as to admit of free motion backward and forward, hinge-fashion, but no lateral or rotary motion. The second vertebra is equally peculiar, having upon one side a large tooth-like prominence which fits into one side of the ring-shaped bone above, and provides for lateral or rotating motion of the head. This tooth-like prominence, known as the *odontoid process*, is kept in place and prevented from injuring the delicate spinal cord which passes close beside it, by means of ligaments which inclose it and hold it firmly in position.

Fig. 29. The first vertebra, called the Atlas.

Another peculiarity worthy of mention is the fact that the arches of the cervical vertebræ being larger than in other parts, the spinal canal is larger in the neck than in any other part of its length. This is undoubtedly a wise provision of nature to allow of the greatest possible freedom of motion without injury to the delicate structures within.

The skull itself may be considered as simply the expanded upper extremity of the spinal column, representing three or four vertebræ which have been consolidated and greatly modified.

The Thorax.—This is a bony cavity formed by the spinal column behind, the sternum in front, and the ribs at the sides. It contains the lungs, heart, great blood-vessels, nerves, and other important organs. Having already described the vertebræ, we will now notice—

The Ribs.—These bones are twelve in number on each side. Occasionally there are found thirteen, instead of twelve, and sometimes there are but eleven. The ribs are joined behind, to the sides of the vertebræ, in such a manner as to allow a slight hinge motion. In front they are not united directly to any bone, but by means of an intervening piece of cartilage they are joined to the sternum. The first seven ribs, being united by separate cartilages, are called *true* ribs, while the last five, being joined to a single cartilage which unites them to the sternum, are called *false* ribs. The last one or two ribs, sometimes not being united to the sternum at all, are denominated *floating* ribs.

Along the lower and inner border of the ribs runs a groove in

which are placed the nerves and blood-vessels of the chest walls, which are thus shielded from injury. The two edges of this groove serve as points of attachment for the two sets of muscles which fill the spaces between the ribs.

The Sternum.—This bone, commonly called the breast-bone, is really made up of four separate parts, three of which are bony, being joined together by cartilage, the fourth and lower part being cartilaginous, and known as the *xiphoid*, or *ensiform* cartilage. The sternum receives upon either side, the cartilages of the seven upper ribs and the conjoined cartilage of the false ribs, together with the inner ends of the collar-bone, or clavicle. The object of the sternum is to brace and strengthen the ribs and clavicles, and help to inclose the chest.

We should mention that the ensiform cartilage is very variable in its form, sometimes curving outward abruptly, causing a considerable prominence, and at other times curving inward. We have frequently been consulted by persons possessing some peculiarity of this organ, who had been made to believe by quacks that they were suffering with some very severe malady. Not long ago we received a letter from a young lady, a former patient, who was in great distress, having been told by a physician whom she had consulted, or a man who called himself a physician and had practiced on the credulity of the people for many years, that she was suffering with cancer, and that she should by all means visit a surgeon at once and have the malignant growth removed. Suspecting that there was some blunder in the matter, we advised the young lady to visit us before having any operation performed, which she accordingly did; and greatly to her relief we were enabled to inform her that no operation was required. The ignorant doctor had mistaken an unusually prominent ensiform cartilage for a cancer, probably considering his diagnosis confirmed by the fact that there was extreme tenderness just beneath the end of the sternum, due to abnormal sensibility of the stomach, the patient suffering from painful dyspepsia. Having met in practice one or two similar cases, we deem it worth while to call attention to this source of error.

The Pelvis.—This portion of the trunk is situated at its base, constituting the point of junction of the lower extremities with the trunk. It is composed of four bones: the *sacrum*, a wedge-shaped bone behind; the *ossa innominata*, two bones upon the sides; and the *coccyx*

below. These four bones are so shaped and joined together as to form a sort of basin by which are supported the upper soft parts of the body, particularly the abdominal organs. The several bones are joined together so firmly that scarcely any degree of motion is possible, especially in the adult. In early childhood each of the several bones named is made up of several separate portions, which are usually described in the anatomies, but which have no special practical interest, and so need not be noticed here except in a general way. Upon the back side of the sacrum is found an incomplete canal which is a continuation of the spinal canal and is occupied by the spinal column, which spreads out upon the lower portion of the bone in a peculiar manner that has given it the name of *cauda equina,* from a fancied resemblance to the tail of a horse. Through large openings in the sacrum the spinal nerves pass forward to supply important organs within the pelvis and the anterior portions of the lower extremities.

At the outer and inferior part of the *os innominatum*, at the point of junction of the three original portions of the bone, is found a deep socket called the *acetabulum*, from its resemblance to an ancient Roman vinegar cup. This deep pocket is for the reception of the head of the femur, the bone of the thigh, by which is formed the hip joint. In life the socket is further deepened and strengthened by a rim of cartilage which surmounts its edge, as also by a strong band called the capsular ligament, which surrounds the socket and the head of the bone, being attached to each, an arrangement which also exists in most other joints.

Upon the lower side of the two hip bones are broad prominences which support the weight of the body in sitting.

The female pelvis differs from that of the male in being larger, smoother, and less curved. This difference is so marked that it is an important means of distinguishing between male and female skeletons.

The form and position of the pelvis are well shown in the view of the skeleton given in PLATE I.

The Hyoid Bone.—This little bone, though situated so near the head as to be hardly included in the bones of the trunk, is yet of sufficient importance to require mention and description, and may as well be noticed here as elsewhere. It is the bone of the tongue, to which it is attached, and is not connected with any other bone. It is shaped some like a horseshoe, and is situated about an inch below the chin, between the root of the tongue and the upper part of the larynx. It carries the epiglottis, the cartilaginous valve which guards the entrance to the windpipe.

It also forms the center of attachment for the muscles which move the tongue and throat.

BONES OF THE UPPER EXTREMITIES.

The bones of each superior extremity consist of the *scapula, clavicle, humerus, ulna, radius,* eight wrist or *carpal* bones, five hand or *metacarpal* bones, and fourteen *phalanges* or finger bones, making thirty-two in all.

The Scapula.—This is an irregular flat bone of triangular shape, situated at the posterior part of the shoulder, forming what is commonly known as the shoulder-blade. Crossing the upper part of the bone is a sharp prominence known as the spine, which passes forward and terminates in a beak-shaped projection which overhangs the shoulder joint; beneath this is a shallow depression known as the *glenoid fossa,* which receives the head of the arm bone in the formation of the shoulder joint. The scapula is not joined either by articulation or by ligaments to any of the other bones of the trunk, as it is designed to allow to the shoulder joint the greatest possible freedom of motion, being attached to the trunk by strong muscles which hold it in place with sufficient firmness to give all needed strength to the joint.

The Clavicle.—This bone, commonly known as the collar-bone, is shaped almost exactly like the italic letter *f.* It is attached at its inner extremity to the breast-bone, and by its outer to the great prominence of the scapula. Its object is to brace the shoulders apart and thus add to the strength of the upper extremities. The clavicle is found in but few quadrupeds, but is largely developed in birds for the same reason that it is present in man. This bone is frequently broken, but as the parts cannot be very greatly displaced, the fractured ends usually unite with little difficulty and only slight deformity.

The Arm.—The bone of the arm proper is the *humerus,* which extends from the shoulder to the elbow, of both of which joints it forms a part. It has a straight shaft and rounded extremities which are protected by cartilage in the manner common to all bones entering into freely acting joints. The lower end of the bone presents a notch at its inner side through which passes an important nerve which is distributed to the inner side of the hand. It is this nerve which is hit when tingling sensations in the little finger are caused by striking the elbow against a sharp corner. In common parlance this part is called the funny or crazy bone, though, as just seen, it is not a bone at all, but a nerve. By

placing the end of the thumb in this notch and pressing hard it is possible to produce the peculiar sensation at any time.

The Fore-Arm.—The fore-arm is composed of two bones, the *ulna* and the *radius.* The first-mentioned of these is the longer of the two, and forms with the humerus the principal part of the elbow joint, extending from the elbow down to the wrist on the little-finger side of the arm. It has but a slight articulation with the wrist.

The *radius* has a large articulating surface at the wrist and a very small one at the elbow. The two bones are united their whole length by a strong ligament. The upper end of the radius rolls in a notch upon the side of the ulna, its end resting against the lower end of the humerus.

The Hand.—The remaining bones of the upper extremity are included in the hand, which is divided into three portions: the *carpus*, or wrist; the *metacarpus*, the portion between the wrist and the fingers; and the fingers, or *phalanges.*

The *carpus*, or wrist, is composed of eight small bones arranged in two rows, possessing smooth articular surfaces, an arrangement which allows of great freedom of motion in a variety of directions.

The *metacarpus* consists of five bones, which join the digits to the wrist. Their motion is quite limited.

The digits consist of four fingers and a thumb. The fingers have each three phalanges, but the thumb has only two. Some, however, consider that there are but four metacarpal bones, which would allow the thumb three phalanges like the other digits.

The finger joints are so constructed that they are capable of not only a hinge motion, but also a slight degree of rotary motion, which gives to the hand great suppleness and diversity of action.

THE LOWER EXTREMITIES.

The lower extremities comprise thirty bones, which will be described in their order.

The Thigh.—The *femur*, or thigh bone, is the largest and longest of all the bones in the body. It presents at its upper end a remarkable prominence called its head, by which it forms, with the acetabulum of the os innominatum, the hip joint. Its lower end is greatly expanded to form the knee joint, the most extensive articulation in the body.

The Leg.—The leg, like the fore-arm, is made up of two bones. The larger of these, the *tibia*, is the principal bone of the leg, forming

the chief part in the leg portion of both the knee and the ankle joints, its companion bone, the *fibula,* taking but little part in either. The latter bone is a long, slim structure, placed beside the tibia upon the outer part of the leg. Its lower end forms the outer ankle. The two bones are firmly united throughout their whole length by a strong ligament.

A third small bone is found in the tendon of one of the large muscles of the leg, which passes over the front portion of the knee; this is termed the *patella,* or knee-cap. It exactly fits upon and protects the front side of the knee joint, which would otherwise be exposed to injury.

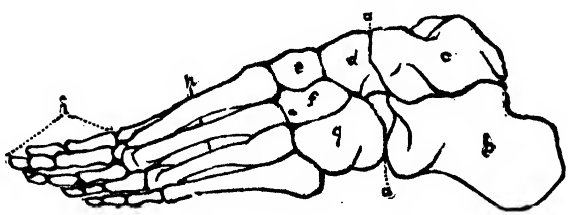


Fig. 30. Outline of the bones of the foot, showing at *c*, the *Astragalus*; *b*, the *Os Calcis*, or heel bone; *h*, the *Tarsus*; and *i*, *Phalanges* of the toes.

The Foot.—Fig. 30. Like the hand, the foot is divided into three parts,—the ankle, instep, or *tarsus*, the *metatarsus*, and the digits, or toes.

The *tarsus* is made up of seven bones corresponding to the eight bones of the wrist. One of these, the *astragalus*, supports the lower end of the tibia; another, known as the *os calcis*, forms the heel and receives the attachment of the *tendo-Achilles*, the strongest tendon in the body. All are so firmly bound together that the ankle is strong enough to sustain the whole weight of the body, notwithstanding the greater number of separate bones which enter into its formation.

The *metatarsus* consists of five bones closely resembling the bones of the hand, and answering the same purpose.

The digits are five in number, each, except the great toe, having three phalanges, the latter having but two, as in the case of the thumb.

The peculiar manner in which the bones of the foot are united is a matter worthy of attention. Instead of being joined together on the same plane, they are so united as to form an arch from every point of view, both laterally and longitudinally. This arrangement greatly adds to the strength of the foot, and gives it an elasticity which protects other parts of the body from sudden jars and shocks.

The general shape and mutual relation of the bones of both extrem-

ities can be readily seen by reference to the view of the skeleton given in PLATE I.

Sesamoid Bones.—In various parts of the body where tendons pass over joints with considerable friction, small bones are often formed in the tendons, which from their resemblance to the seeds of the sesamum are termed *sesamoid* bones. The patellæ are bones of this class. Other sesamoid bones are often found in the feet and hands.

Wormian Bones.—Extra bones are sometimes formed in the cranium for the purpose of filling up a deficiency between contiguous bones. In some skulls large numbers of these bones may be found, varying in size from that of half a pea to a half-dollar. These are called *wormian* bones.

Bones of the Ear.—Fig. 31. The list of bones is not complete

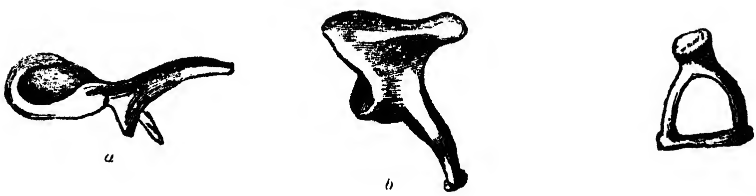


Fig. 31. Bones of the ear. *a. Malleus*, or mallet; *b. Incus*, or anvil; *c. Stapes*, or stirrup.

without the eight minute *ossicles* which help to form the apparatus for hearing. These we shall not describe in this connection, however, as their full description more properly belongs to the special anatomy of the ear, which see.

PHYSIOLOGY OF THE BONES.

As the particular uses of the different bones of the body have already been noticed in connection with their description, we need now concern ourselves only in relation to the general functions of the bones and the uses of special groups. The functions of bones may be said to be support, protection, and motion. Each of these functions we will now examine more particularly.

Support.—As a whole, the skeleton forms the framework of the entire body. Upon its firmness depends that of the softer parts which are built upon it, the muscles, nerves, membranes, and other tissues. Without the skeleton, the other tissues would fall into inextricable

confusion. By means of the skeleton, the head is held erect, and the limbs supported in proper position, giving them efficiency and symmetry.

Protection.—Equally striking is the dependence of numerous parts of the body upon the skeleton for protection from external injury. Of this we have many examples. The skull is admirably adapted to the protection of the brain, the most delicate of all the vital tissues, being a bony cell, well arched to secure the greatest possible strength to resist external violence, and composed of two walls with a peculiar arrangement of tissue between, especially calculated to deaden the effect of blows applied to the head by accident or design.

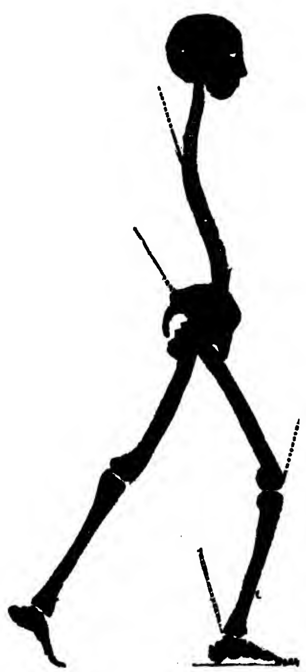


Fig. 32. Designed to show how the jar of walking is prevented from reaching the brain, by means of the curves of the body.

The head is still further protected by the peculiar curves of the spinal column, upon which it rests. This will be best understood by reference to Fig. 32, by which it will be seen that blows received from below, as in jumping, or even in walking upon a hard surface, are little felt by the head, since the various curves conduct away the lines of force and thus prevent much of it from reaching the head.

Still another means of protection is provided for the delicate brain, as if to secure it against the possibility of injury, in the fibro-cartilaginous cushions placed between the vertebræ. See Fig. 28. The elasticity of these discs of cartilage causes them to yield to pressure whether it be slowly or suddenly applied, and thus the brain is protected from the full force of concussions which otherwise might seriously injure it. Even slight concussions constantly occurring when one is walking over an uneven surface would, without this provision, undoubtedly occasion serious injury to the brain and the delicate organs connected with it. The amount of this kind of action is better appreciated by reference to the well-known fact that people who are much upon their feet during the day, especially those who are traveling about over

uneven surfaces, diminish very appreciably in height between morning and evening. Most persons vary an inch in height, and instances have been noted in which persons have lost more than two inches in height through vigorous and prolonged exercise. This is caused by the thinning of the cartilage discs from the prolonged pressure to which they are subjected. In elderly people the same thinning takes place, permanently diminishing their stature.

The spinal cord is protected by the bony canal formed by the rings of the several vertebræ composing the spinal column. The enlargement of this canal in the cervical portion, where it is much larger than the cord, is a marked instance of nature's fine adaptation of means to ends. The neck is designed to be turned in every direction freely; but this freedom of motion would disturb the function of the spinal cord except for the arrangement mentioned.

Another example of protection is seen in the thorax, which is a bony cage in which are encased the lungs, heart, great blood-vessels, important nerves, and several other vital organs.

The pelvis also protects within its wide-spreading arch several important vital organs.

Throughout the body, as a rule, the large blood-vessels and most important nerve trunks are protected by their position upon the inner and under sides of the bones near which they run.

Motion.—The bones are the passive agents in the production of motion. The muscles, being excited to action by the nerves, employ the bones as levers. In walking, the body is, by means of the muscles acting on the bones, pried about from place to place. It is a curious fact that nearly all of the simple kinds of mechanical appliances are utilized in the production of motion; but as this subject will be dwelt upon at much greater length in connection with the study of the muscles, we will devote no further space to it here.

An Interesting Function of the Bones.—Recent discoveries have shown that the bones serve other very useful and important purposes than those which may be termed mechanical. Carefully conducted researches have revealed the remarkable and interesting fact that the bones are active in the formation of blood cells. The marrow of the bone produces both red and white corpuscles. The white blood corpuscles produced in the bones are somewhat different in appearance from those of the spleen and lymphatic glands, and in certain forms of disease are produced in excessive numbers.

Composition of the Bones.—Bone substance is a curious compound of living matter and matter possessing so low a grade of life that it is even doubted by some whether or not it possesses life at all. For convenience of description, it is customary to speak of the elements of bone as being organized and inorganic, the two being supposed to be intimately blended together. It is more than probable, as before intimated, that this is not a correct statement of the fact, but that bone, like all other tissues, is a living, organized structure throughout, but so exceedingly complex in its nature that its elements are easily separated from their combination.

Recollecting the real truth in the matter, we may proceed to examine the composition of bone, for convenience considering it as a mechanical compound of certain living elements with others that are not possessed of life. If a bone is placed in the fire for a short time, when taken out it will be found to have changed its nature very remarkably. First, it will be noticed that it has lost one-third of its weight; and, second, it will be observed that it has lost its strength and toughness. A slight force will break it, and it may be easily crumbled to a fine powder; yet it retains precisely its original form and general appearance.

If, instead of placing the bone in the fire, we had immersed it in a solution of muriatic acid for a few days or weeks, we should have obtained very different results. Supposing that we have done so, we find the bone still retaining its original form and appearance, but upon weighing it we discover that it has lost two-thirds of its weight. Its nature has also changed; for instead of being firm and inflexible, it is now so flexible that, if a rib or a fibula, it may be tied into a knot. Fig. 33.

Fig. 33. A long bone which has been rendered so flexible by soaking in diluted muriatic acid that it can be tied into a knot.

If bones which have been treated in these ways be submitted to a careful chemical examination, it will be found that the bone which has been burned has lost all of its animal matter, the residue being a mixture of carbonates and phosphates of various bases. The bone which was immersed in acid will be found, on the other hand, to have lost all its mineral matter, the animal or vitalized organized portion of the bone remaining.

A careful analysis of the bones conducted in this manner, by the aid of the most refined processes known to chemical science, has determined the composition of bone to be as shown in the following table:—

Organic Matter	Gelatine and blood-vessels,	33.30
Inorganic, or Earthy matter	Phosphate of lime,	51.04
	Carbonate of lime,	11.30
	Fluoride of calcium,	2.00
	Phosphate of magnesia,	1.16
	Soda and chloride of sodium,	1.20
		100.00

In childhood the proportion of animal matter is much greater, so that the bones of infants and children are much more flexible than those of older people, and much less liable to fracture. In old age, on the contrary, the proportion of mineral matter greatly increases, so that the bones become exceedingly brittle, and break with very slight violence. A child will fall several feet without suffering graver injury than slight bruises which will heal in a few hours. An old person, suffering half the violence, will not escape without broken limbs. It has often happened that an elderly person has broken an arm or a leg by simply rolling off the bed during sleep, or even tripping upon a door-sill and falling upon the floor.

HYGIENE OF THE BONES.

Although the bones when once well formed are much less liable to disease than most of the softer parts of the body, yet they are undoubtedly affected by various morbid influences, and during the period of development are especially liable to become diseased in a variety of ways. We shall attempt to point out in as brief and concise a manner as possible some of the principal sources of danger to the integrity of this part of the system and the means necessary to secure the healthy development of the bones in early life, and their maintenance in a healthy condition in adult life.

Proper Development.—First of all, proper development is essential to the health of the bones as well as of other tissues of the body. If a morbid condition has been received by inheritance, of course the defect cannot be remedied; but most frequently faulty development is due to

faults which can be avoided. The chief causes of faulty development may be said to be,—

1. *Improper Food.*—By improper food we mean that which is lacking in the elements of nutrition necessary to form healthy bones. This is sometimes due to poor health, as defective digestion, on the part of the mother, so that the food she furnishes her infant both before and after birth is lacking in the proper elements of nutrition not only for the bones but for all the tissues. The defect may be in the quality of the mother's food. If she attempts to gain nourishment from fine-flour bread, strong tea, and lager beer, with perhaps a long list of harmful articles besides, the child will certainly suffer, not only with defective bones, but with defective mental development, and will be lacking generally.

Not infrequently, perhaps most often, defective nutrition of the bones arises from the attempt to rear an infant by hand upon such trash as corn-starch, tapioca, fine-flour gruel, and almost any one of a dozen varieties of "baby food" which are lauded in the newspapers, but the only recommendation of which is that they hasten the little sufferers out of misery. No food is so good for the young infant as that furnished it by nature. If through illness or incapacity the mother is unable to furnish the proper quality or amount of food, then cow's or goat's milk, or some other proper substitute, should be provided. Full directions for such cases are given under the proper heading.

2. Another cause of defective development is deficient or too early exercise. Children that are kept constantly confined indoors cannot develop strong, healthy bones, any more than they can develop vigorous muscles. Exercise is essential to the development of every organ of the body, as well as to the maintenance of health in organs originally well developed.

On the other hand, allowing children to begin to exercise too early, as attempting to teach them to walk before the bones have acquired sufficient firmness to sustain without injury the weight of the body, may dwarf and deform the child so that proper development may be impossible.

Putting children at work at employments which tax them by requiring continuous application for long periods is a most injurious and inhuman practice. When this is done, ossification is hastened, and becomes completed before the individual has attained his full growth, thus dwarfing him. The thousands of diminutive young men and women to be

found in the vicinity of large manufacturing cities bear testimony to the truth of this observation.

The bones of young children are soft and pliable, and yield when subjected to more strain than they can bear, thus becoming distorted. The exercise of children should always be varied, and should be given with frequent intervals for rest. Prolonged action is much more taxing to children than more violent exercise with frequent periods of rest; but both should be avoided. Moderate exertion and plenty of rest are the essential principles of development by exercise for children.

Spinal Curvatures.— Almost a volume might be written on the evil results of improper positions assumed in lying, sitting, standing, and walking; but our space is limited, and as the subject will be again referred to under the head of "Hygiene of the Muscles," we shall now simply touch upon the most important points which bear particularly upon the hygiene of the bones. It is in childhood especially that errors of this kind exert most strongly their baneful influence.

Probably to improper positions in school-rooms, where boys and girls as students are usually confined several hours for each five days in the week, is due a large share of the distortions of the spine which are so exceedingly common nowadays. Dress-makers and most tailors are well posted on the frequency of spinal curvature, on account of the great number of instances in which dresses, coats, and other garments have to be cut and padded to hide deformities of this sort. Spinal curvatures are much more common among young ladies than in the opposite sex, for the reason that young men and boys usually engage in such vigorous, active sports out of school hours that the evils occasioned by confinement in improper attitudes are in a considerable degree counteracted. We have for several years made a special point of observing with considerable care the persons whom we meet in traveling, in the streets, and in various other ways, with reference to this point; and we have been astonished to see in what a large proportion of young persons, particularly young ladies, some degree of variation of the spinal column from the natural form exists. We have noticed particularly on more than one occasion the very great frequency of this form of deformity in young ladies in attendance at our city schools. In cases in which the curvature is lateral, it may be discovered at a glance by the difference in prominence of the two shoulders. The shoulder upon the concave or hollow side of the curve is always lower than that on the opposite side.

One great cause of the serious injury to students, and especially the younger class of school-children, is the use of improper seats and desks, or seats and desks not adapted to the age or size of those who occupy them. It may be well to remark, however, that the evil is becoming generally recognized by our foremost educators, and the improvements already made in this direction by manufacturers give reason to hope that the difficulty will soon be remedied, so far as the mechanical construction of seats and desks is concerned. But this alone will not remedy the evil; teachers must fully appreciate its gravity and must do their part in inducing students to assume and maintain a correct attitude in sitting at their studies. When engaged in study, students, especially if they are near-sighted or if the light is poor or print defective, are very apt to lean forward until the spine is very considerably curved. This is especially the case when engaged in ciphering or writing. The effect of this is to produce a permanent forward curving of the spine, and round shoulders, a deformity the most serious aspect of which is by no means its detraction from the good appearance of an individual. At the same time, most generally, a lateral curvature is produced by sitting with one arm upon the desk while the other is not, the desk being so high as to require the shoulder to be elevated to bring the elbow upon it. This position is a very common one with students, and to it is due the greater share of the cases of lateral curvature.

At first a curvature is only a functional distortion, being due to weakening of some of the muscles of the back, but by degrees it becomes permanent, as will be seen by a glance at the structure of the spinal column. It will be recollected that the vertebral column is made up of twenty-four separate bones arranged one above another, with discs of elastic cartilage between. It will also be recollected that the observation was made that these cartilages may lose their elasticity in some degree by continuous pressure, so that they become thinned, thus making a person shorter at night than in the morning, the variation being from one to two inches in different persons, and according to the amount of exercise taken. From these facts it will be readily seen that if the spinal column be bent and retained in a curved position for any considerable time, the discs of cartilage will become thinner upon the side upon which the pressure is applied, that is upon the hollow side of the curve, than upon the opposite side. Again, it will be readily understood that if this occurs daily for a con-

siderable period, the thinning upon the side brought under pressure may become permanent. This is exactly what does occur. The cartilages, which are naturally of equal thickness on the two sides, become so changed that they resemble wedges. This is well seen in the illustrations. See Figs. 34, 35, 36.

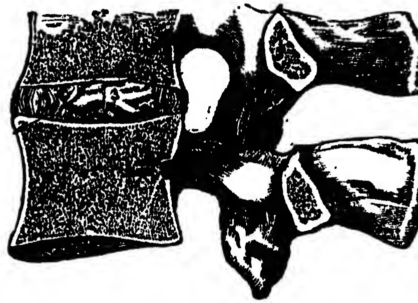


Fig. 34. Section of vertebræ, showing, at 3, Fibro-Cartilage Disc of normal shape.

Fig. 35. Diagram showing the Cartilage, 3, thickened as the result of an anterior curvature of the spine, the spines of the vertebræ, *ss*, being brought near together.

Fig. 36. Diagram showing the Cartilage, 3, thinned by pressure resulting from a posterior curvature, the ends of the spines, *ss*, being separated more than usual.

We have in our possession a section of the spinal column which we removed from the body of an individual in whom it had become so curved as to almost exactly resemble the letter S. In this case the cartilages were in exactly the condition represented in the accompanying cut above referred to. We have recently had under treatment a number of cases of curvature in girls whose bad positions in sitting at school were responsible for the deformity from which they suffered. In one case in which there was double curvature of the spine, represented in Fig. 37, the young lady's height was increased by treatment two inches in a few weeks, by simply straightening the spine and restoring the cartilage discs to their proper uniform thickness. In another case an inch and a half was gained in the same way, though in the latter instance there was posterior as

well as double lateral curvature. The mode of treatment employed is detailed elsewhere.

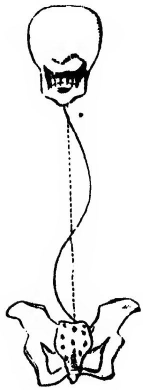


Fig. 37.
Double curvature of the spine.

It is too evident to need special explanation that if the permanent thinning of the intervertebral cartilages has existed a very long time, no method of treatment will be of avail. Hence the importance, not only of taking every precaution to prevent the evil in the first place, but of adopting the necessary curative measures as soon as the deformity is discovered.

Deformity from Tight-Lacing.—While the bones suffer the least of any organs from the absurd custom which fashion has imposed upon the gentler sex,—and, we are informed, at times upon the other sex as well,—tight-lacing the waist and encasing the body in a vise of stays of bone or steel, is of positive and often incurable injury to this part of the vital economy, and is indirectly the source of far greater damage to more vital parts.

The reader will remember that in considering the anatomy of the thorax, attention was called to the fact that the bony ribs do not join the sternum directly, but indirectly through the medium of flexible cartilages, an arrangement which gives to the thorax the power to expand and thus enable the lungs the better to perform their important functions. Careful study has shown that this flexibility of the costal cartilages is due to their constant exercise. Day and night, sleeping or waking, twenty times a minute, these flexible parts are bent and allowed to return again to their natural position. This constant bending and unbending allows them no opportunity to become stiff and unyielding, like the bones. But when the chest is imprisoned in a corset, this constant movement becomes impossible; and the consequence is that a process of stiffening is set up, and after a time the once flexible, yielding cartilages become as rigid as the rest of the ribs. The inevitable result of this change is a permanent limitation of the movements of the lungs. It becomes impossible for them to expand except to a limited degree upward and downward. Lateral expansion is as impossible when the corset is laid aside as when it is in place. The deformity, which was at first temporary, has become permanent. There are thousands of delicate ladies all over the land whose costal cartilages have been thus changed through their own willful abuse of their bodies, and who will undoubtedly go down into premature graves in consequence, in spite of all that the most skillful physicians can do for them.

The chest ought to be capable of expanding from two to five inches,— even greater expansion is attainable. But if you put a tape-line around one of these corset-stiffened chests, you will be unable to obtain more than a scant quarter-inch of difference in measurement between the chest when empty and when filled to its utmost capacity. We have often tried the experiment when making examinations, and though the patient is usually anxious to do her best, in order to demonstrate, if possible, what every lady will eagerly contend for, that her corset never did her any harm because it was worn so loose, and so draws up her shoulders to the utmost and makes a desperate attempt to swallow more air than there is room for, we have often found that the chest expansion was imperceptible. If tight-lacing did no other harm than this, we should wish to condemn it in the strongest terms. We support an army of missionaries among the unappreciative and degenerated inhabitants of heathen countries, who value human life so little that they feed their superfluous little ones to the crocodiles, and sacrifice a score of women to commemorate the death of a king, while we pay little attention to the millions in civilized lands who are sacrificing lives which might be a hundred-fold more useful, in ways equally absurd. Let us have missionaries to go into every city, village, and community, and preach the life-saving gospel of health.

The following is a tabulated statement of some facts bearing especially upon the matter of waist proportion: —

	Average height.	Average waist.	Ave. per cent of waist to height.
American women	61.64 in.	24.44 in.	39.6
Telugu women of India	60.49 in.	24.65 in.	40.6
English women (brickmakers with heavy skirts)	60.06 in.	25.00 in.	41.3
French women	61.06 in.	28.00 in.	45 4
Chinese women	57.85 in	26.27 in.	45 4
Yuma women	66.56 in.	36.84 in.	55.2
Civilized men — American	67.96 in.	29.46 in.	43.3
Mrs. Langtry	67.00 in.	26.00 in.	38 8
Venus de Milo	.....	.....	47.6

	Height.	Waist.	Percentage of waist to height.
Average of 43 women, from 18 to 25 years old	60.7 in.	27.1 in.	44.64
Average of 25 women, from 18 to 30 years old wearing corsets or tight bands	62.5 in.	23.3 in.	37.3
Average of the same 25 women a few months after reforming their mode of dress	62.5 in.	27.15 in.	43.4
Average of 10 girls, from 9 to 12 years old	....	23.5 in.	....
Average of 2000 men, from 18 to 27 years, measured by Dr. Seaver, of Yale	68.6 in.	29.3 in.	42.7

A question to which I invite attention is, Why does the waist of the civilized woman cease to grow at the age of 10 or 12 years, while the rest of the body continues to develop? Lungs, liver, stomach, spleen, bowels, pancreas — all the organs which occupy the region of the waist line, continue to grow, but the waist of the civilized woman absolutely refuses to increase in size, notwithstanding the developing force beneath it, after the age of 12 or 14 years. I find the average waist measure of girls from 9 to 12 years of age to be 23.5. I have in some instances found the waist measure in girls of twelve to be 26 inches. The rational answer to this question is the fact that about this age the constricting influence of tight bands, corset waists, or corsets begins. The fashionable dressmaker insists that the young lady's figure must be "*formed*," and so as she develops, she grows into a mold like a cucumber in a bottle. And thus it happens that we find the civilized woman with a waist disproportionately small, as we find among the aristocratic class of Chinese women, dwarfed and misshapen feet. The small-footed woman of China, in consequence of her deformity, is compelled to hobble about in a most ungraceful fashion, requiring usually one or more persons to sustain her in keeping her balance. She cannot run, skip, or dance as can her large-footed sisters. She is willing, however, to endure the inconveniences of being a cripple and the loss of the use of her feet and legs rather than forego the pleasure of being in fashion. If the sacrifices which the civilized woman makes to fashion were no greater, there would be comparatively small ground for complaint, but the constant girding of the waist results in mischiefs of vastly greater magnitude than those which the Chinese woman inflicts upon herself.

As the flat-headed woman watches with interest and growing pride the progressive depression of her infant's skull, while from day to day she binds more tightly upon it the flattened disc of wood; and as the Chinese woman glories in the shriveled and misshapen stump of what was once her child's foot, as a developing mark of aristocratic gentility, in like manner does the civilized mother pride herself on the smallness and roundness of her daughter's corset-deformed waist, disregarding alike the suggestions of art, the warnings of science, and the admonitions which nature gives in the discomfort and distress occasioned by the effort to secure a change in the natural contour of the human form,— a change which is more monstrous in its violation of the laws of beauty, more

widely at variance with the dictates of reason, and more disastrous in its consequences to bodily health and vigor, than any similar barbarity practiced upon themselves or their children by the members of any savage or semi-savage tribe.

Abuse of the Feet.—Though we have not space here to elucidate fully the subject of the hygiene of the feet, we cannot forbear calling attention to the very common evil practices which relate to them.

A French slipper is as unfit for a human foot as a horseshoe. Far more sensible would it be to return to the ancient custom, and wear the rude, homely sandals which graced the feet of the maidens of ancient Egypt.

Let us look a moment at the evils of these fashionable coverings for the feet, at least for ladies' feet. The custom of wearing tight shoes with narrow soles and high, narrow heels, begins in early maidenhood, if not in childhood or infancy, and sometimes the absurd fashion even seizes upon the child as soon as she leaves the cradle, for the precocious little one is so smart she must be a lady at once, and so must do as ladies do. At this period the bones are so soft and flexible, the ligaments so yielding, that they are easily forced into almost any mold, and the process of deforming them begins. The small boot or gaiter worn,—and it is always as small as can possibly be pressed upon the foot with the thinnest possible stocking,—allows no room for development of the organ, and the improper shape produces deformity and distortion. The fashionable American girl does in a somewhat more limited degree exactly what is done for the Chinese maiden by a process of bandaging, of which we will elsewhere give our readers a description. The narrow soles and small toes cramp the foot and prevent it from supporting the weight of the body upon its whole under surface as designed by nature. The high heel throws the weight forward upon the toes, which still further embarrasses them in their cramped condition, and greatly increases the injury arising from narrow toes and soles. We have often witnessed some of these unfortunate young women tiptoeing along the streets, evidently conscious of appearing awkward and uncouth, and vainly endeavoring to conceal their crippled gait. The farther toward the toes the heel is set, the worse this difficulty becomes. In some of the latest foreign styles the wearer is barely able to touch her toe to the ground, except at the risk of tipping over forward, and when walking appears like a person stumping along on stilts.

THE MUSCLES.

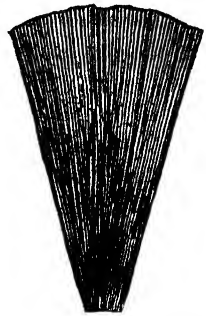
The muscles constitute the flesh, or lean meat, of animals. Their general structure may be readily seen in the boiled leg of a fowl. By a little care the round mass of flesh forming the thigh may be separated into coarse fibres, which by careful manipulation can be still further divided into tiny threads. Under the microscope the finest fibres which can be seen by the naked eye are found to be composed of still smaller fibres, which are the anatomical elements of muscular tissue, and have already been studied. In a muscle these minute fibres are bound up in little bundles, which are again united into larger bundles, and these are bound up together in a common sheath to form the complete muscle.

Two Kinds of Muscles.—As already pointed out, there are two varieties of muscles, which are distinguished both by their structure and by their mode of action. They are known as *voluntary* and *involuntary* muscles. The voluntary muscles are chiefly located upon the exterior of the body, giving roundness and symmetry to the form. They are employed in all voluntary motions. The involuntary muscles are chiefly found in the interior of the body, in membranes, the walls of cavities, of blood-vessels, and of the various outlets of the body. Involuntary fibres also abound in the skin, being attached near the roots of the hairs. It is by their contraction that the skin is made to assume the appearance of goose-flesh.

The Tendons.—In order to give the muscles strength and greater efficiency they are not usually attached directly to the bones with which they are connected, and in conjunction with which they give rise to the various movements of which the body is capable, but are united to them by means of tendons, which are white, glistening bodies composed of tough, inelastic, fibrous tissue similar to that which forms ligaments. Tendons are sometimes very short, but at other times are drawn out into long, thin cords, traveling some distance from the muscle before being attached to the bone.

Form and Arrangement of Muscles.—The voluntary muscles are of various forms, as will be seen by reference to the accompanying cuts, Figs. 37, 38, 39, and 40. By this diversity of form they are adapted to all the different positions in which they are required to act.

PLATE II.—*THE MUSCLES.*



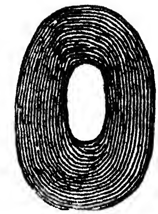


Fig. 37½. Fig. 38. Fig. 39. Fig. 40.

Fig. 37½. Fusiform, or Spindle-Shaped Muscle, having a tendon at each end.
Fig. 38. Pennate, or Feather-Shaped Muscle.
Fig. 39. Fan-Shaped Muscle.
Fig. 40. Circular, or Orbicular Muscle.

The voluntary muscles, with few exceptions, exist in pairs, the two halves of the body being symmetrical.

NAMES AND ACTION OF SPECIAL MUSCLES.

Of the more than five hundred distinct muscles in the body we can mention but a very few of the most important. Indeed, the action of a large number of the smaller muscles is so obscured by others that it is hardly worth our while to attempt to study them closely. For the sake of convenience and brevity we will notice the action of each of the muscles named in immediate connection with its description, although this part more properly belongs to the physiology of the muscular system. See PLATE II and Fig. 41, for a general view of the muscles.

Muscles of the Head.—See Figs. 42 and 43. The muscles of the head, including those of the face, are among the most interesting of all in the body. Of the large number of special muscles in this region only a few can be here mentioned by name.

The Occipito-Frontalis.—This muscle is attached to the skull at the back part of the head, and by means of a long, thin, flat tendon is carried over the top of the head to the forehead, the other end being attached to the skin of the latter region. The scalp is closely adherent to the tendon of the muscle. By contraction of this muscle the forehead is wrinkled and the eyebrows elevated. In some persons the muscle is under such complete control that the whole scalp can be moved very freely.

The Corrugator Supercilii.—This might be called the frowning muscle. It is located near the inner and upper border of the eye. By its contraction the skin of the forehead is drawn down and wrinkled, as in scowling.

Fig. 41. General View of the Muscles.

Orbicularis Palpebrarum.—The little muscle which bears this long name is the circular muscle of the eye. Its fibres surround and aid in forming the eyelids, and by their contraction the eye is closed. There are several other muscles connected with the external parts of the eye, which we have not space to mention.

Auricular Muscles.—There are three little muscles connected with each ear, located just beneath the skin, which seem to be designed to move the external ear in various directions; but practically they are of no use in man. In lower animals these tiny muscles are developed into large and useful ones, as in the horse, dog, and rabbit. There may occasionally be found a person in whom these muscles are so well developed that the ear may be moved at will, though so slightly that no advantage can be derived from the action. Darwinian philosophers tell us that these rudimentary muscles are vestiges of the large, strong muscles possessed by man's primeval ancestors, who may have been able to use their ears as fly-brushes for the protection of the face.

Muscles of the Nose.—The soft parts of the nose are made up of muscles which compress its lower portion, elevate and depress and dilate the nostrils, each receiving a name descriptive of its particular function. One of the little muscles which operate upon the nose carries the most formidable name of any muscle in the body, being designated as the *levator labii superioris alæque nasi*, which translated means the elevator of the upper lip and of the nostril.

Muscles of the Mouth.—Nine pairs of muscles operate upon the mouth and lips, their stationary ends being attached to the bones of the

face adjacent to the mouth, and their moving ends being connected by a circular muscle which surrounds the mouth, known as the *orbicularis oris.* The use of the last-named muscle is to aid in closing the mouth and to pucker the lips as in whistling.

Muscles of Expression.—Most of the muscles connected with the mouth and lips are chiefly useful in giving expression to the countenance. Through the action of these muscles, together with those of the external parts of the eye and nose, the face becomes a mirror of the mind. For instance, when feelings of joy or merriment are experienced the muscles of the upper part of the face contract in such a way as to drag the corners of the mouth outward and slightly upward, as in laughing or smiling. When opposite emotions are experienced, as in grief or sullenness, the corners of the mouth are drawn down, the muscles of the lower part of the face being contracted in such a way as to draw the lines of expression downward. All other emotions of the mind are indicated with equal distinctness, so that a person of any degree of experience in observing men and things can tell with almost absolute certainty the general tenor of the thoughts of one to whom he is speaking. So close is the relation between the mind and the muscles of expression that it is absolutely impossible for a person to be strongly affected by any emotion without in some degree exhibiting the same in the face. For example, it is not possible for a person to be merry in mind and at the same time assume an appearance of grief upon the face which could not readily be detected as an attempt at deception.

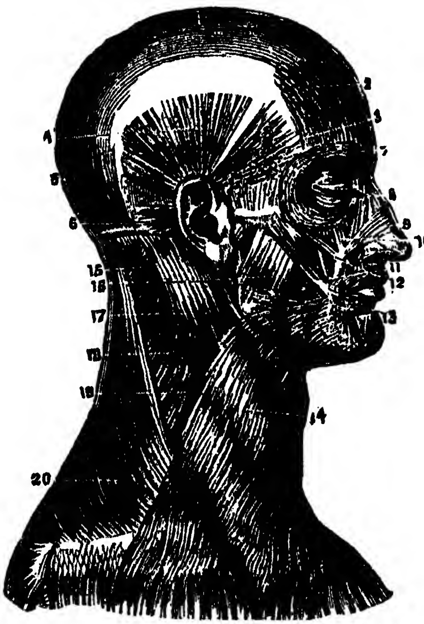


Fig. 42. 2 and 5. Occipito-frontalis; 3, 4, and 6. Muscles of the Ear; 7. Orbicularis Palpebrarum; 8. Levator Labii Superioris Alæque Nasi; 9. Compressor Naris; 10. Levator Anguli Oris; 11. Buccinator; 12. Zygomaticus Minor; 13. Orbicularis Oris and Zygomaticus Major; 14. Platysma Myoides; 15. Splenius; 16. Masseter; 17. Sterno-cleido-mastoid; 18. Levator Scapulæ; 19. Scalenus Medius; 20. Trapezius.

Fig. 43. This cut shows with greater distinctness some of the deeper Muscles of the Face, and those of its lower part.

Muscles of Mastication.—Besides the muscles of the face already mentioned, there is a set of muscles located at the back part of the cheek which are attached at one end to the skull and upper bones of the face, and at the other to the inferior jaw-bone. These are quite strong muscles, and their function is to move the lower jaw in talking, and particularly in mastication. The principal muscles for this purpose are the *temporal* and the *masseter.*

Internal Muscles of the Eye.—The system of muscles by which the eye is moved is one of the most marvelous exhibitions of mechanism in the body. The motions of the eyeball are produced by six slender muscles which chiefly arise from the bottom of the socket behind the eye, and are attached to its outer covering. Four of these produce the movements of the eye upward, downward, to the right, and to the left. The other two are ingeniously arranged in such a manner as to roll the eye and to move it in an oblique direction, hence they are known as the oblique muscles of the eye. One of these, the superior oblique, operates by means of a pulley arrangement, its tendon passing through a loop and changing its direction before being inserted into the eyeball. By the combined action of these several muscles, all the different motions are obtained; all acting in rapid succession cause the eye to roll in its socket in such a way as to enable the sight to describe a complete circle. In persons who are cross-eyed or wall-eyed, some of the muscles just described are affected. For illustration of muscles of the eye, see Fig. 44.

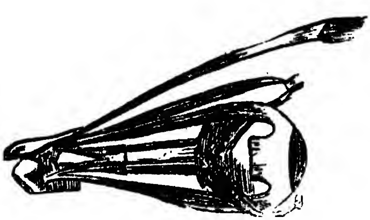


Fig. 44. Showing the Muscles of the Eye.

Internal Ear Muscles.—Within the interior of the ear there are to be found three little muscles, the most delicate in the whole body, which operate upon the minute ear bones and other parts of the middle ear, in regulating the function of hearing.

Muscles of the Neck.—The muscles of the neck may be rudely divided into two sets; those in front, and those of the back part of the neck. The anterior muscles are useful in depressing the lower jaw, in raising the bone of the throat, in compressing the throat and controlling the organs used in speaking and swallowing, and to bend the head forward.

The muscles of the back part of the neck are chiefly useful for moving the head. By their action the head may be thrown backward or to one side. They are quite strong muscles, and are needed to enable a person to maintain the head in an erect position. A long, slim muscle which passes from the back part of the head to the upper end of the breast-bone, called the *sterno-cleido-mastoid* muscle, by contraction becomes the cause of wry neck, for which disease it is sometimes necessary to divide it by a surgical operation.

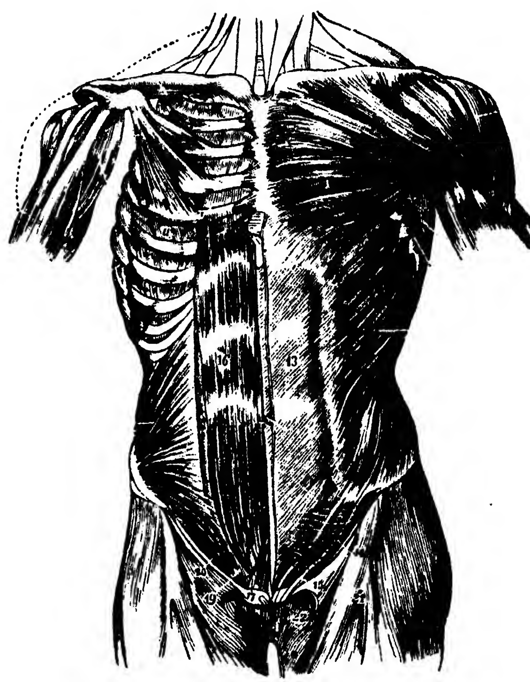


Fig. 45. Showing Muscles of the Trunk.

Muscles of the Trunk.—These also may be divided into two groups, those found upon the front of the trunk, and those upon the back. The muscles of the front form the principal portion of the abdominal walls. They are attached to the borders of the ribs and the breast-bone above, and to the edges of the pelvis below. They bend the body forward, and assist in keeping it erect. They are also exceedingly useful in respiration, and aid in several other vital operations. Between each two ribs there is a double set of muscles which assist in the contraction and expansion of the thorax in respiration. The upper part of the chest also affords attachment to several large muscles which act upon the upper extremities. The muscles of the back are exceedingly numerous,

being arranged in five distinct layers. They arise for the most part from the projecting points of bone which have been already described as being found in great numbers on the vertebræ which make up the spinal column. Some also arise from the skull, from the ribs, and from the pelvis. They hold the body erect, give to the trunk a great variety of movements, draw the head backward, assist in moving the arm, and aid in respiration. This is undoubtedly the most complicated part of the muscular system. For a view of the muscles of the trunk, see Fig. 45.

Muscles within the Trunk. — Of the muscles within the trunk of the body the most important is the *diaphragm*, which is a broad, circular muscle dividing the cavity of the thorax from that of the abdomen. Its outer border is attached throughout its whole circumference to the lower parts of the ribs and their cartilages and the upper lumbar vertebræ. The muscular fibres converge from the circumference and unite in the center in a large, flat, tendonous portion which forms the center of the diaphragm. In a state of rest, the muscle rises into the cavity of the thorax like a dome. By its contraction it becomes depressed to a more nearly horizontal position, thus aiding inspiration by increasing the size of the thoracic cavity. The diaphragm is one of the most important muscles of the body. Though voluntary in its structure and under control of the will, like the other ordinary muscles of respiration, it acts involuntarily, and thus carries on the process of respiration during sleep.

The other muscles found within the trunk are connected with the lower extremities, arising upon the inner sides of the pelvis and passing out to be attached to the upper part of the thigh bones. They are useful for turning the limb so as to bring the toes outward, to aid in holding the body erect and in bending it.

Muscles of the Upper Extremities. — These comprise the muscles of the shoulder, arm, fore-arm, and hand. Most of the muscles of the shoulder assist the movements of the arm, and so do not require special notice. The arm proper is acted upon by eleven muscles, eight of which are attached to the scapula. The remaining three arise from the trunk of the body and the fore-arm. The most important of these are the *deltoid*, which covers the shoulder and raises the arm to a horizontal position; the *pectoralis major*, which brings the arm forward upon the chest — this is the muscle chiefly used by birds in flying, being in them enormously developed; the *latissimus dorsi*, a large muscle which arises from the trunk, and is connected with the upper and back part of the arm, which it draws backward and to the side.

The movements of the fore-arm are freer than those of any other part of the body, unless it be the hand. Its principal motions are *flexion,* bending upon the arm ; *extention,* restoration to its straight condition after flexion ; *rotation inward,* turning of the palm of the hand toward the body ; *rotation outward,* movement in the opposite direction. These movements are accomplished by thirteen different muscles, most of which rise from the scapula and arm, and are attached to different parts of the bone of the fore-arm. The most important of these are the *biceps,* which is the principal muscle employed in flexion of the fore-arm ; the *triceps,* which extends the fore-arm, antagonizing the biceps ; the *pronator teres* and *pronator quadratus,* which turn the arm inward ; and the *supinator brevis,* which rotates it outward.

Muscles of the Wrist.—The wrist is moved by sixteen different muscles, its chief movements being forward, backward, outward, and inward. Movements in other directions are made by combinations of muscles operating in these different ways. The principal muscles of the wrist proper are, one which flexes it upon the ulna, another which flexes it upon the radius, and two muscles, a long one and a short one, which extend the wrist, antagonizing the flexors.

Muscles of the Thumb and Fingers.—The thumb and fingers of each hand are operated by eighteen different muscles, half of which are capable of producing several different motions. It is this fact which gives to the human hand the wonderful dexterity which enables man to carry into execution the most subtle mechanical contrivances suggested by his active brain. It is claimed by some, and has not been contradicted that we are aware of, that the human hand has done almost as much to bring man to his present highly educated and civilized state as the brain itself, granting, of course, that the brain is the motive power. In no other known animal is there so great an independence of action in the digits as in man. The power of opposing the thumb to the four other digits is what gives the hand its greatest efficiency, enabling it to grasp very small objects between the ends of the fingers and the thumbs. The study of digits in different animals is an exceedingly interesting branch of knowledge.

Muscles of the Lower Extremities.—The muscles of the inferior extremities are in a great degree analogous to those of the arm, corresponding quite closely in number, relation, and function.

Muscles of the Thigh.—These are chiefly large, strong muscles, aris-

ing from the pelvis. The thigh is moved by twenty distinct muscles, the principal of which are the three *glutei* muscles which form the fleshy part of the hip, and the three *adductor* muscles which draw the limb forcibly toward the central line of the body.

The Muscles of the Leg.—The leg is moved by ten muscles, the chief of which are, the *biceps*, by which it is flexed upon the thigh; the *rectus femoris*, by which the leg is extended or straightened—it is the lower end of this muscle which is inserted into the knee-cap, or patella, which is in turn attached by a ligament to the upper part of the leg bone, or tibia; and the *sartorius*, or tailor's muscle, which is used in crossing the legs beneath the body when sitting down in tailor fashion.

Muscles of the Foot.—The ankle and toes are moved by twenty separate muscles, of which we will only mention the *gastrocnemius* and *soleus*, which form the chief part of the calf of the leg. There is much less freedom of motion in the digits of the feet than in those of the hand, although the number and relations of their muscles are much the same. A considerable degree of control over the toes can be obtained, however, by practice, as is shown in the case of persons who, being deprived of hands, have learned to write legibly with their toes.

PHYSIOLOGY OF THE MUSCLES.

The sole property of a muscular fibre is contractility. Muscular fibres are said to possess a natural irritability by means of which they respond to proper kinds of stimulation by contracting. The ordinary and most natural stimulus to muscular contraction is nerve force. Through the connection of the nerves with the muscles, nerve force generated in the living batteries of the system—the nerve cells of the brain and spinal cord—is communicated to the muscle fibres, which are by this means made to contract. Muscular fibres may also be made to contract by the stimulus of electricity, which in many respects very closely resembles the nerve force. Mechanical and chemical irritation, such as striking, tearing, or pinching the muscle, or applying an acid or some other irritant, has a similar effect.

It was formerly supposed that muscles could be made to contract only through the medium of nerves. It is now known, however, that this view is incorrect, since by direct irritation muscular contraction can be produced when the nerves are completely paralyzed.

The contractile power of muscular fibres is not only always present while they retain their life, but is always active. Contrary to the general supposition, the muscles are never quiet. They are always actively at work, and it is by means of this constant contraction that the symmetry of the body is preserved. A proof of this is found in the fact that when a single set of muscles is paralyzed, the part becomes distorted by the contraction of the antagonizing muscles. This is often seen in the face in cases of paralysis of one side. A short time ago we had under treatment a patient in whom the extensor muscles of both fore-arms had been paralyzed, so that there was loss of power to straighten the hands. The fingers were all bent toward the palm. The patient could lift quite a heavy weight, but could not open the hand, and could scarcely move a finger except to close it tighter. By the application of proper treatment to the paralyzed muscles upon the outer side of the arm the patient recovered the power to control the hand and straighten the fingers. This peculiar property is called muscular tonicity.

How a Muscle Contracts.—The contraction of a muscle, though very simple, is still interesting. If the arm be clasped with the hand, and the fore-arm be then bent, the hand being closed and a considerable degree of force exerted, as in lifting a heavy weight, it will be observed that the arm becomes larger, seeming to swell out beneath the grasp. If a single muscular fibre were under examination beneath a good microscope, as a live fibre just taken from a frog or a turtle, we might cause it to contract by a very feeble current of electricity; and should we do so, we should notice essentially the same thing; we should find that the fibre would become thicker, but at the same time it would become shorter. As already explained, a muscle is made up of a large number of fibres; and its contraction as a whole is due to the contraction of each one of the minute fibres which compose it. As each one of these thickens and shortens in the process, the whole muscle thickens and shortens. There is no increase in size in the muscle, but simply a change of form. This is the simple manner in which all motion is produced.

Mechanical Action of Muscles.—As elsewhere remarked, the muscles use the bones as levers in executing their various movements. Not only the lever but also the pulley, another mechanical power, is illustrated in the action of the muscles. It will be both interesting and profitable to notice some of these exhibitions of vital mechanics.

A lever consists essentially of a rigid bar of some sort, a point of rest for the bar, which may be at one end or at any point between the ends, called the *fulcrum*; the *power*, which is applied to some part of the lever away from the fulcrum; and the *weight*, the object to be lifted. There are described three kinds of levers, which are illustrated in Figs. 46, 47, 48. In the first kind, it will be noticed that the weight is upon one side of the rest, or fulcrum, and the power on the other side. In the second kind of lever, shown in Fig. 47, the weight is between the power and the fulcrum. In both instances there is a gain of power, because the force is applied at the long arm of the lever. In the third class, Fig. 48, the power is between the weight and the fulcrum. Now the power is applied at a disadvantage, as the weight is at the long arm of the lever. However, there is compensation; for what is lost in power is gained in speed or motion.

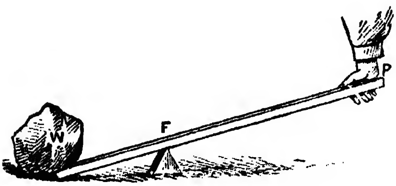


Fig. 46.

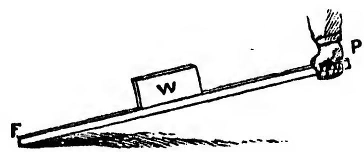


Fig. 47.

Now, regarding the muscles as the power, the bones as the levers, the work to be done, that is, the objects to be lifted, carried, pushed, or otherwise moved by the muscles, as the weight, let us see how these different forms of levers are illustrated in the human body.

The first kind of lever is rarely illustrated in the body. It is found, however, as in the action of the muscles of the back of the neck upon the head. The top of the spinal column is the fulcrum, the head itself the lever, the muscles of the neck the power, and the front part of the head the weight to be lifted.

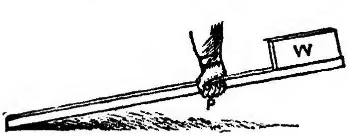


Fig 48.

Illustrations of the other two kinds of levers are very abundant. In the foot, employed in the ordinary act of walking, we have a good illustration of a lever of the second class. When the body is supported on tiptoe, the foot is the lever, the earth the fulcrum, the body the weight, and the muscles of the calf the power. See Fig. 49.

Fig. 50 illustrates by the arm a lever of the third class. Here the fore-arm is the lever, the elbow is the fulcrum, the muscles of the fore-arm the power, and the dumb-bell lifted in the hand the weight. The power, being applied between the fulcrum and the weight, lifts the ball at a disadvantage, as it evidently requires more strength to hold the ball in position as shown in the figure than it would to lift it straight up with the arm by the side.

Fig. 49. In the above cut the foot, c, represents a lever with the fulcrum at F, the weight of the body lifted through the bones of the leg, joining the foot at W, and the power applied at P, the heel, through the contraction of the muscles of the calf, a.

It is not a mistake of nature that the muscles and bones of the arm are so arranged that the power is applied at a mechanical disadvantage, since what is lost in lifting power is gained in rapidity and extent of motion. By means of this arrangement the dexterity of the hands is very greatly increased, and they are far better fitted for the great variety of rapid movements which they are required to execute than they could otherwise be.

The pulley principle is beautifully and perfectly illustrated in one of the muscles of the eye, as before mentioned, and also in a muscle of the neck called the *di-gastric*, from the fact that it has two bellies, or fleshy portions. As will be seen in the cut (Fig. 51), the middle and tendonous portion of the muscle is held by a loop through which it plays, the loop constituting a real pulley. Marvelous indeed are the works of the Creator, and "fearfully and wonderfully made" is his creature, man.

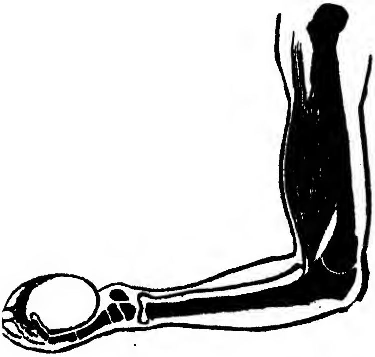


Fig. 50. The arm, representing a lever of the third class.

Uses of Muscles.—Incidentally the muscles add symmetry to the body. They fill up the hollows and cover up the rough excrescences of the bones, and in numerous ways add to the beauty and roundness of the form. But the really important function of the muscles is to produce motion. In this work the muscles are constantly engaged. Whether we sleep or wake, still the delicate muscular fibres

of the body are employed in unceasing activity, performing their part in the various vital processes necessary to life. Locomotion, manual motion, and vocalization, or speaking, are among the most important voluntary movements produced by muscular action; while respiration, digestion, and the circulation of the blood are equally or even more important processes, largely dependent upon both voluntary and involuntary muscular action.

Fig. 51.

It may be well for us to devote a brief space to the consideration of how these several processes are performed.

Locomotion.—The act of walking or progression from one point to another by means of muscular action, has been much studied by physiologists in both man and lower animals. Perhaps the simplest explanation of the act of walking would be that it is a continuous falling forward, the body being constantly saved from actually falling to the ground by the alternate placing forward of the feet to recover the equilibrium. The description of the several acts of walking, running, and leaping are so admirably given by Prof. Dalton, one of the most lucid writers of the day on physiology, that we shall take the liberty to quote the following paragraphs from his pen:—

"The movements of walking, running, leaping, etc., are performed as follows: When the body stands upright, the feet are planted flat upon the ground, bearing at once upon the heels behind and the ball of the toes in front, the weight of the body resting between the two, upon the middle of the arch of the foot. The body is maintained in this position, as we have seen, by the various muscles, which act in such a way as to keep its different parts carefully balanced, and to retain the weight of the whole suspended exactly over the ankle-joint.

"Now in walking, when a movement is to be executed in advance, the body is first made to lean a little forward, so that its weight no longer remains above the ankle, but is thrown forward so as to rest entirely upon the toes. The heel is then lifted from the ground by the action of the very strong muscles situated on the back part of the leg, called the gastrocnemius and soleus muscles."

"At the moment that the body is raised and tilted forward in this way, the other foot is lifted entirely from the ground and swung forward so as to take a step in advance. As soon as the body has been

carried far enough in an onward direction, the second foot is also raised in the same manner as before, while the first is swung forward in its turn to take another step. In this way the two legs act alternately, the weight of the body being carried forward first by one and then by the other; all the muscles, however, upon the two sides combining harmoniously in their action, so as to produce an easy, graceful, and continuous movement.

"In the act of walking, as above described, one foot is always upon the ground, and the weight of the body is mainly supported in this way by bearing upon the toes; it is only lifted forward alternately on the two sides by the leverage of the bones of the foot. Consequently no violent muscular exertion is required, and the movement can be kept up for a long time without fatigue.

"The act of running, however, instead of being a series of steps, is performed by a succession of leaps or springs, in each of which the whole body is thrown clear of the ground, and carried forward by the impetus which it has received. In order to accomplish this, at the moment the heel is about to be raised by the action of the muscles above described, the knee and hip joints are first bent and then instantly straightened by the sudden contraction of their exterior muscles. The whole limb thus acts like a powerful spring, which, by its sudden extension, throws the entire body off the ground and carries it through the air in an onward direction. The opposite limb is at the same time thrown forward to receive the weight of the body and to perform, in its turn, and with similar rapidity, the same movements. The speed of the runner depends on the vigor of the muscular contractions, and the swiftness with which the successive motions are performed.

"The act of jumping is accomplished in a similar way to that of running, except that the same motions are executed by both limbs together, so that each leap is performed by itself, and is not combined with others in a continuous movement."

Manual Motion.—The great diversity of the movements of the hand admit of no general description. When we consider the large number of muscles which must be made to co-operate harmoniously in the production of a single movement of the hand, we are led to marvel at the wonderful degree of delicacy of touch and motion that is possible to a hand carefully trained to fine work. Jewelers, watchmakers, microscopists, and engravers exhibit this nicety of control of

the muscles of the arm and hand in a remarkable degree. The difference between a trained and an untrained hand is readily seen in comparing the manual motions of a skilled artisan with those of a backwoodsman, whose finest tool has been an ax or possibly a chisel.

In the dextrous use of the hand and arm, man is far superior to all lower orders. He may not be able to construct a bird's nest exactly like the one found in the forest tree, but he can make that which is vastly more delicate and more beautiful. If we except the human brain, with its marvelous properties of thinking, feeling, and willing, there is no more wonderful exhibition of creative skill than in the structure and functions of the human hand.

Speaking.—While voice is not wholly the result of muscular action, special organs being required to act in conjunction with the forcible expulsion of air by the expiratory muscles, it is really one result of motion, since without muscular effort the most elaborate vocal apparatus in the world could accomplish nothing. The great share of created animals possess some form of speech, as well as man, and it is in all produced chiefly by muscular action. This is as true of the birds which whistle and carol in the trees, as of the tiny insects which chirp and hum amid the shrubs and flowers.

Muscular Action in Respiration.—As already stated, respiration is performed by muscles which are really voluntary in character, being under the control of the will, but which are so controlled by the nervous system that they are kept in constant motion. The wisdom of this arrangement will be readily seen. Involuntary muscles are very slow in their action, while voluntary muscles act promptly and with vigor. Respiration is a function which requires continuous, and often rapid, execution. In emergencies it is often necessary that air should be inhaled or expelled with great promptness, which can only be done by voluntary muscles. Again, it is sometimes essential that the function of breathing should be suspended temporarily, as when the body is immersed in water or surrounded with smoke or noxious fumes, which could not well be done if it were performed by involuntary muscles.

Muscular Action in Digestion.—Prehension, the act of taking food, mastication, and the preliminary act of swallowing, are all performed by voluntary muscles; while the movement of the food along the alimentary canal, bringing it in contact with the various digestive juices and the absorbents by which it is digested and taken up into the blood,

is wholly due to involuntary muscles which form a large part of the walls of the œsophagus and the whole alimentary canal. The churning action of the stomach by which the gastric juice is as it were squeezed out and mingled with the food to be digested, is also due to muscular contraction.

Muscular Action in the Circulation of the Blood.—The circulation of the blood, through the means of the heart and blood-vessels, is almost entirely due to muscular effort. The heart is itself nothing more nor less than a hollow muscle, and the arteries are simply muscular tubes. The contractile action of the heart is continued through the arteries, and thus the blood is forced out into the veins, through which it is urged along, both by the pressure from behind and by the squeezing action of the muscles as they bulge in contraction.

Relation of Muscles and Nerves.—During life the muscular system is wholly controlled by the nervous system. Every contraction, whether of a voluntary or of an involuntary muscle, is instigated by an impulse sent out from the nervous system. Hence it will be readily seen that the muscles are wholly under the domain of the nerves, and must depend for their utility and efficiency upon the integrity of the source of their force and activity. The muscles may be in reality strong, being well nourished; but if the nervous system is weak and exhausted, the muscles cannot manifest the force of which they are really capable.

Fatigue.—Muscular action occasions muscular wear and waste. The most delicate contraction of the smallest muscle is accompanied by a definite amount of destruction of tissue. The greater the amount or intensity of muscular effort, the greater the amount of waste. Only a certain degree of destruction of tissue by action is possible. After the muscular tissues have wasted to a certain degree, they refuse to respond to the demands of the nerves. A violent effort of the will may secure a slight additional amount of work, but even the most powerful exercise of will cannot excite to action a muscular system which has been exhausted by prolonged activity. The sense of weariness, inability or incapacity for action following violent or prolonged exertion, is called fatigue. Its cause we have already seen. The sense of fatigue is a demand of nature for rest, for time to repair the wasted tissues, to eliminate the poisons resulting from work. This provision nature has wisely made to oblige us to stop the vital machinery before it has become so much damaged that repairs cannot be made. This admonition comes

with such force that it cannot be resisted for any length of time. Unfortunately for the race, however, ingenious man has discovered that there are agents which will quiet or smother this warning voice, thus allowing the individual to go on destroying his tissues beyond the point of safety at which nature admonishes him to stop. Alcohol and tobacco are among the most active and frequently used of these substances, and tea and coffee belong in the same category. Very strangely, too, these agents are employed and recommended for the very purpose which renders them dangerous, and that, too, by men of learning and intelligence on most subjects, but who fail to see the folly of their action in this particular case. Alcohol, tobacco, tea, coffee, opium, hashish, and other narcotics and stimulants, will make a man feel well, and think he is not tired when he is exhausted; but they will not give him additional strength. By deceiving him they will enable him to get a little more work out of his muscles, to waste them a little more, but they do not supply him any force to use in the extra labor. A tired man is no more saved from the effects of overlabor, except in his feelings, by a glass of grog, a pipe or chew of tobacco, or a cigar, or a cup of tea or coffee, than a patient is saved from the results of the surgeon's knife by being made insensible by an anesthetic. The action is precisely the same in both cases. The individual feels better, but only because his sensibilities are benumbed, because he is deceived, not because he is really better. The fact is that he is worse off. Statistics show that patients are less likely to make good recoveries from the effects of surgical operations when chloroform is used than when it is not used. Just so it is with the substances named; when taken to relieve fatigue or to enable a person to do more work, they really damage the individual more or less permanently, because they make it impossible for him to recruit so well when the period of rest is obtained. The proper course to pursue is to stop work when nature says "enough," and rest. Stimulants only put off the day of reckoning for a little time, and they run up an enormous account to be answered for when the day of retribution comes.

Muscular Electricity.—Experiments upon both human beings and animals have clearly demonstrated that the human body is a real electrical battery, generating appreciable quantities of electricity by every vital act. Every muscular contraction generates a current of electricity the exact quantity and quality of which can be determined by the proper instruments. There is no special electrical apparatus in the human body, as in certain fishes and other curious animals which pro-

duce this subtile agent in prodigious quantities, but the whole body develops it. Every breath we draw, every heart-beat, every wink of the eye, even every thought, generates the same element that darts destruction from the thunder cloud, and flashes intelligence around the world. This interesting fact has an important bearing on the question which has occupied so many scientific minds, viz., the nature of vital force. The appearance would seem to be that the same force which in the living tissues is manifested as vitality, when the tissues are worn out and broken down appears as electricity or some other commonly known form of force.

Muscular Sense.—The muscles possess in but very slight degree, if at all, the general sensibility which belongs to most other tissues. They have little sensibility to pain. They may be pierced, cut, or even torn, without giving much pain. A peculiar pain is produced by cramp, or spasmodic contraction of a muscle. There is good evidence, however, that the muscles are compensated for the want of general sensibility by the possession of a sense peculiar to themselves, known as *the sense of weight, or the muscular sense.* It is by means of this sense that we appreciate resistance or judge of the weight of various bodies.

Rigor Mortis.—The peculiar rigidity which comes on soon after death in man and animals is supposed to be due to coagulation of the muscular fibre. It is the beginning of decomposition, and indicates the death of the muscular fibres. It is observed that in persons who die suddenly in a state of comparative health, as from accident, rigor mortis does not appear for some hours after death, and then remains for some time. In persons who die from long-continued or wasting disease, the opposite in both particulars is true.

HYGIENE OF THE MUSCULAR SYSTEM.

The muscles, perhaps, more than any other organs of the body, depend for their health upon regular, systematic, adequate, and proper exercise. By exercise, the muscular fibres are made to contract, and in doing so, the old, stagnant, venous blood is squeezed out, and new, fresh, invigorating, vitalizing blood takes its place. By this means their vital activities are quickened and their growth increased. There is evidence for believing that muscular fibres do not increase in number in the voluntary muscles; but it is certain that they increase very materially in size and in firmness, and hence in strength. The

strength of a muscle depends upon the individual strength of each of its fibres, as its strength is but the combined strength of its component parts. If each fibre becomes large, firm, and strong in consequence of use, the whole muscle becomes so; and that this is the case we have abundant evidence in the ponderous right arm of the blacksmith, which outgrows the other in consequence of constant exercise in swinging a heavy hammer. The lower extremities of a ballet dancer become developed in a proportionately large degree, from the trying exercises to which they are accustomed.

Effect of Disuse of Muscles.—Nature never attempts to maintain a useless organ, and almost as soon as an organ is not used she sets to work to demolish it; or at any rate she wastes no time in endeavoring to keep it in repair when it is not needed, or at least is not used. This is true all through the vital economy, and is nowhere more clearly seen than in the muscular system. A disused muscle soon becomes thin, pale, relaxed, weak; and after a time a change begins which is termed fatty degeneration. Nature does not think it worth while to keep so much valuable nitrogenous matter lying idle, and so she sets to work taking the muscle to pieces and carrying it away little by little for use elsewhere, depositing in place of the muscle substance little particles of fat until the whole muscle is changed to fat. This change actually occurs in cases of paralysis; and when it has been completed, restoration of the function of the muscle is impossible.

The Hindoo devotee who in blind zeal for his religion holds out his arm until the muscles shrink and shrivel up, leaving the arm but a useless appendage of the body, more dead than alive, is violating the law of nature which demands exercise for health, no more than the student who shuts himself up with his books until his limbs grow lank and thin and his fingers bony with physical idleness; and the latter acts no more wisely in sacrificing himself upon the shrine of learning, than the other in deforming himself to appease the wrath or win the favor of Buddha.

How to Take Exercise.—It is not sufficient to simply take exercise indiscriminately and without reference to the object for which it is taken, the manner, time, etc. It must be taken regularly, systematically, at proper times, and in proper quantity. Perhaps we cannot do better in treating this subject practically than to ask and answer some of the most important questions relating to this matter.

1. *When is the best time to exercise?* There is a popular theory extant that exercise taken early in the morning has some specific virtue superior to that taken at any other time. After careful observation on the subject we have become convinced that this popular notion is a mistake when adopted as a rule for everybody. For many busy professional men, especially lawyers, editors, authors, clergymen, teachers, and others whose vocations keep them mostly indoors, the morning may be the only time when exercise can be taken conveniently; and if not taken at this time it is likely to be neglected altogether. Such persons, unless they are laboring under some special derangement of the health, as dyspepsia or some other constitutional malady, had better by far take the morning walk or other form of exercise than to take none at all. However, we are pretty well convinced that for most persons the middle of the forenoon is a much better time to take any kind of active or vigorous exercise. In the morning the circulation is generally weakest and the supply of nerve force is the least abundant. In the forenoon, when the breakfast has been eaten and digestion has become well advanced, the system is at its maximum of vigor; hence, if the individual is at liberty to choose his time for exercise, this should be his choice.

For poor sleepers, a half-hour's exercise taken in the evening not long before retiring will often act like a soporific, and without any of the unpleasant after-effects of drugs.

Vigorous exercise should never be taken immediately nor within an hour after a meal, and should not be taken immediately before eating. Disregard for this rule is a very common cause of dyspepsia.

2. *What kind of exercise shall be taken?* The answer to this question must, of course, vary with the individual. Exercise must be modified to suit the strength, the age, the sex, and even the tastes of the individual. As a general rule, persons who take exercise for health are apt to overdo the matter, the result of which is damage rather than benefit. For most persons there is no more admirable and advantageous form of exercise than walking; but many find walking simply for exercise too tedious to persevere in it regularly. Such will find advantage in walking in companies, provided care is taken to avoid all such questionable diversions as walking matches or any kind of exercise in which there will be a strife which will be likely to excite to excess.

Horseback riding, for those who ride well and enjoy this form of

exercise, may be of great benefit. It is not so well suited for ladies as for men, however, on account of the awkward and unnatural manner in which fashion compels them to ride. It is impossible for a lady to ride with the same degree of comfort, ease, and grace that her male companion may, on account of the one-sided way in which she sits in the saddle. In many other countries ladies ride in the same fashion as men; with them, of course, this objection does not hold.

Horseback riding is an excellent aid to digestion, and often effectually relieves habitual constipation of the bowels.

Carriage riding is worth little as a form of exercise except for very feeble invalids, for whom the gentle swaying of the vehicle and the excitement of viewing objects seldom seen may be sufficient and appropriate exercise. Riding in a lumber wagon over a corduroy road is about the only kind of carriage riding which is worth speaking of as exercise for people in ordinary health.

Wrestling, fencing, racing, base-ball, foot-ball, dancing, and most other exercises of the sort, are more often harmful than otherwise, because carried to excess and associated with other evils of a pernicious character. Performance upon the trapeze, boxing, and pugilistic training are open to the same objection. Calisthenics, for school-children and young students, is a most admirable form of exercise. It is also well adapted to invalids who are unable to walk more than a short distance at a time. In our opinion, every family ought to be fitted out with all the conveniences for parlor gymnastics. They afford not only healthful exercise but a large amount of excellent amusement for the little folks.

The bicycle is an admirable means of exercise, if properly employed. It may, however, be easily abused both by too violent use and by riding in a cramped or stooped position. Wisely used, it affords one of the most valuable means of developing heart and lung capacity. The writer has recommended bicycle riding in a great number of cases as a means of development for young women of frail physique, and with most admirable results.

Delsarte, if combined with Swedish educational gymnastics, is to be commended as a healthful mode of bodily development. Delsarte alone has little value, except as a means of developing grace of movement and a good standing poise. It must be borne in mind that all exercises should be adapted to the age, sex, and condition of the patient. Even the feeblest may be trained to heavy exercises, if the course of exercises be graduated with sufficient care.

For the majority of persons, no form of exercise is more highly beneficial healthwise than some kind of physical labor. For ladies, general housework is admirably adapted to bring into play all the different muscles of the body, while affording such a variety of different exercises and such frequent change that no part need be very greatly fatigued. There are thousands of young ladies pining under the care of their family physician in spite of all he can do by the most learned and complicated prescriptions, for whom a change of air or a year's residence in some foreign clime, or some similar expensive project, is proposed, when all in the world that is needed to make the delicate creatures well is to require them to change places with their mothers for a few weeks or months. Let them cease thrumming the piano or guitar for a time, and learn to cook, bake, wash, mend, scrub, sweep, and perform the thousand and one little household duties that have made their mothers and grandmothers well and robust before them. We made such a prescription once for a young lady who had been given up to die of consumption by a gray-headed doctor, and whose friends were sadly watching her decline, and in six weeks the young miss was well, and has been so ever since; but we entailed her everlasting dislike, and have no doubt that any physician or other person who should adopt the same course in a similar case would be similarly rewarded.

For young men there is no better or healthier exercise than sawing and chopping wood, doing chores about the house, working in the garden, caring for horses or cows, clearing walks, bringing water, or even helping their mothers in laundry work. Such exercise is light, varied, oft changing, and answers all the requirements for health most admirably. We can heartily recommend it, and from personal experience, too. We advise all young men, who can possibly get a chance, to adopt this form of exercise as being the most certain of bringing back the largest returns for a given expenditure of force of any which can be suggested. There is no gymnasium in the world which is better to secure excellent results from exercise than the kitchen, the washroom, the workshop, the woodyard, the barn, and the garden. These are nature's gymnasia. They require no outlay for special appliances, and are always fitted up for use.

Deficient Exercise by Students.—The common idea that study and brain work are harmful has chiefly grown out of the fact that students usually confine themselves too closely to their books, keep

late hours, and take as little as possible of active out-of-door exercise. There is no doubt but that the majority of students could do more work and better if they would devote at least two hours of each day to purely physical exercise. In ancient Greece, in the palmy days of that empire, physical training was considered as much a part of the necessary education of young men as their mental culture. Every inducement was offered to them to make themselves strong, vigorous, and athletic. Their schools were called gymnasia, on account of the attention given to gymnastics. The young women, too, were trained in physical exercises as well as the young men. Small waists and delicate forms, white, soft, helpless hands and tiny feet were not prized among the pioneers of civilization. The mothers of heroes and philosophers were not pampered and petted and spoiled by indulgence. They were inured to toil, to severe exercise. Their bodies were developed so as to fit them for the duties of maternity and give them constitutions to bequeath to their children which would insure hardihood, courage, and stamina in the conflict with the world to obtain a subsistence, and with human foemen in the rage of battle. The women developed by this system of culture were immortalized in marble, and the beauty of their forms has been the envy of the world from that day to this; yet no one seems to think of attempting to gain the same beauty in the same way. It might be done: there is no reason why it cannot be; but the only way is the one which the Grecian women adopted,—physical culture.

Overtraining.—The careful observation of results in large numbers of cases shows very clearly that there is such a thing as overtraining, and that excessive development of the muscular system is not only not advantageous but absolutely harmful. Trainers are not long-lived. Dr. Winship, who developed his muscles until he was able to lift over three thousand pounds, died when he should have been in his prime. The result of overtraining or excessive development of the muscular system is the weakening of other vital parts of the body. Symmetrical development is the best for health and long life. This is what we plead for, not for extremes in any direction. Let the nerves and the muscles be developed together and equably, and we shall have better results from both than would otherwise be possible. *Mens sana in corpore sano* was the motto of the ancient Greeks; and the experience of every day shows that the man with strong muscles and good digestion, with fair intellectual abilities, is the one who wins the goal to-day in the strife for

wealth and fame and all that men seek after. "A sound mind in a sound body" is as necessary for assured success in life in the nineteenth century as when the sentiment was first inscribed upon the gates of the temples in ancient Greece.

Necessity for Unrestrained Action.—A muscle tied up is rendered as helpless as though it were paralyzed. It will be recollected that when a muscle acts it does so by swelling out in thickness, while contracting in length. From this it will be evident that if a tight band is put around a muscle in such a manner as to prevent its expansion, or increase in thickness, it cannot possibly act. Hence, a fundamental requisite of healthful muscular action is entire freedom from constraint. Unrestrained action is indispensable to complete action and perfect development. When a broken arm is done up in a splint for a few weeks, upon removing the bandage it is usually found that the arm has shrunken in size; the muscles have wasted, partly in consequence of pressure, and partly on account of the enforced inaction of the muscles. The very same thing happens wherever pressure is brought to bear upon the muscular tissues. A ring worn upon a finger causes atrophy, or wasting of the tissues beneath it. By placing an elastic band around soft tissues they may be absorbed altogether, in consequence of the pressure. This action has been taken advantage of for the removal of tumors in certain parts of the body.

Evils of Tight-Lacing and Corset-Wearing.—See Figs. 52 to 55. The wearing of clothing drawn tight about the waist, either with a corset or without, is attended with most serious evil consequences. Without dwelling upon the evils which result from the forcible displacement of important internal organs and the injury to the nervous system, the digestion, and sundry other evil consequences, we wish to call attention to the fact that continuous pressure upon these parts may cause such a degree of degeneration of the muscles of the chest as to seriously impair the breathing capacity. Unused muscles waste away, as already observed; and when pressure is applied in addition, the wasting and degeneration become still more marked. This is exactly what happens with those who wear their clothing tight about the waist. This is the reason why ladies who have been accustomed to wear corsets declare so emphatically that they "could not live without them," that they feel when their corset is off as though they "should fall down in a heap."

The evidence of injury is complete; and it is so universal that few

women will venture to deny that the practice is harmful, but they try to shield themselves by declaring that they are sure *their* corset does them no harm, that it is very loose, etc., etc. We scarcely ever met a lady who would admit that *her* corset was tight, and we have had occasion to speak with hundreds of ladies on this point in making medical

Fig. 52. A waist of natural shape.

Fig. 53. A waist compressed by tight lacing.

examinations. We read the other day in a newspaper of a young woman who actually broke a rib in the attempt to gain another half-inch on her corset string. She well deserved the accident, no doubt: but the chances are ten to one that she would assert in the most positive terms, if expostulated with about the matter, that her corset was "quite loose," and to demonstrate the matter would show you how much more she could pinch up when she tried, or something of the sort. The fact is, ladies do not really know when their clothing is tight about the waist and when it is loose. The tissues have been so long under pressure that they have lost a good share of their sensibility, and clothing really seems loose to them which to a man would be so uncomfortably tight as to make him utterly wretched.

Pantaloons made tight at the top are as harmful as tight dresses, as was well shown in the Russian army some years ago, when the evil of wearing the pantaloons held up by a belt about the waist became so serious among the soldiers as to require interference on the part of the government. The men had become unable to endure marches of any

distance; but upon being compelled to wear suspenders for the pantaloons, they speedily recovered.

Elastics.—The elastic bands worn about the leg to keep the stocking in place, and sometimes used upon the arms to hold the sleeves up, are more harmful than is usually imagined. The long stockings worn by females bring the elastic just above the knee, where the large blood-vessels of the limb come near the surface and are in position to be compressed against the thigh bone in such a way as to impede the circulation. It is not to be wondered at that under these circumstances, in addition to the evil of thin stockings and thin, tight shoes, there should seem to be a necessity for artificial calves, which we are informed on credible authority have actually been employed. The stockings, as well as the other articles of clothing, should be suspended from the shoulders either by means of separate suspenders or by attachment to a waist with broad shoulder-bearings.

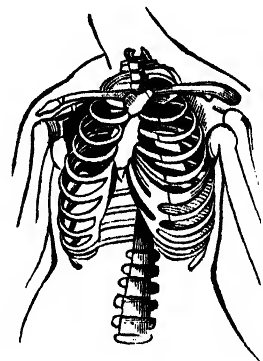


Fig. 54. The ribs in their natural position.

Pull-Backs, Low Shoulders, etc.—The following on this subject we quote from "Evils of Fashionable Dress":—*

"Although the corset is the chief offender in constraining the healthy activity of the vital organs of the body, there are other modes of dress which deserve attention on account of their interference with some of the bodily functions. When the leaders of fashion decreed that the previously indispensable crinoline must be discarded, the sensible part of the world rejoiced, thinking that Dame Fashion was really about to reform her ways. But such hopes were dashed to the ground when the present fashionable style of dress appeared. Formerly, fashionable ladies sailed along the streets like animated balloons, monopolizing the whole walk with their wide-spreading skirts. Now they have reached the opposite extreme, and we see them wriggling along like competitors in a sack-race. Indeed, it is a marvel how that locomotion is a possibility, so greatly hampered are

Fig. 55. Shows the distortion of the ribs produced by corset-wearing.

* Good Health Pub. Co., Battle Creek, Mich.

the limbs by numerous heavy skirts drawn tightly back and fastened at the sides. Anything like graceful ease in walking is impossible. A Chinese wriggle is the result of the best attempt.

"The motions of the arms are curtailed to an almost equal extent by the fashion of the garments about the shoulders. They are so made that it is next to impossible for the wearer to extend the hand an inch above the head. The arms are actually pinioned. Why not have the shoulders of ladies' garments made like those of men, which allow perfect freedom of motion to the arms? Some of the more recent fashions are adopting this style."

Tight Shoes.—We have already said so much on this subject in connection with the hygiene of the bones that we scarcely need add anything here, except to say that the muscles of the feet suffer equally with the bones, perhaps more seriously, being more soft and yielding. We cannot find words to express our views of this foolish and absurd custom. There seems not the slightest shadow of excuse for it, except that Fashion dictates that woman must have a small foot; and if Nature has made such a terrible blunder as to give her one of decent size, she must be tortured for the mistake for which she is not responsible, during the period of her natural—or rather her artificial—life. Fashion dictates a similar mandate in China, and the amount of suffering which the fashionable young women of that country are obliged to endure is even greater than in this country. Perhaps we cannot better impress our readers with the absurdity of this really barbarous fashion than by quoting from an interesting work entitled "Oriental Women" the following graphic description of the extent to which the practice is carried in China:—

"It is supposed by many foreigners that this curious compression of the feet is accomplished by means of wooden or iron-bound shoes placed upon the feet in infancy, effectually dwarfing them by preventing their growth altogether. But this is by no means the case. It is next to an impossibility for a foreign gentleman to secure the privilege of examining a foot thus deformed; but after more than a week of the most skillful diplomacy, in all of which I was aided and abetted by Miss Lucy H. Hoag, preceptress of the mission-school for girls in Kiu-Kiang, I succeeded in persuading a girl about fifteen years of age to allow me to be present when the gay covering was removed from her foot; afterward in Shanghai, by the liberal use of money, an el-

derly woman of the small-footed class was persuaded to gratify my curiosity by removing the bandage from her foot; and from the knowledge gained on those occasions and afterward I will briefly describe the method of 'making the foot,' as it is called.

"The binding is rarely, if ever, commenced before the child is five years, and in most cases not until she is six or seven years old. This delay is to allow the limbs a vigorous start and growth, and the girl to learn how to walk firmly. The operators are usually women who make this their business, although frequently the mother or some other female member of the household, takes the matter in hand. In the first place, all the toes, excepting the great toe, are folded down under the foot, the fleshy part of the heel is forced downward and forward, and a bandage (consisting of a strip of colored muslin four or five feet long and three inches wide) is wound back and forth in a figure of eight, over the folded toes, along the length of the foot, across the instep, and around the heel, pressing that toward the great toe to shorten the foot. The bandage is wound snugly at first, and then tightened a little at each succeeding operation. This gradually throws the instep up, and virtually breaks it, so that when the bandage is removed, the front part of the foot may be moved like a door upon its hinges. Under this process the foot becomes attenuated until it is merely a mass of bones covered with tendons and skin. The development of the muscles of the calf is also checked, and the leg tapers from

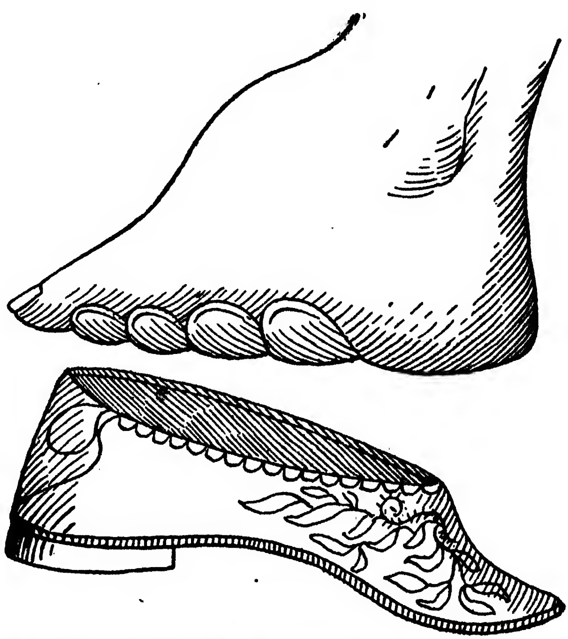


Fig. 56. Outline of Chinese lady's foot and slipper, showing effects of bandaging.

the knee downward, and the entire limb loses its elasticity, although no excessive weakness is observed. How the circulation is kept up through the extremities is more than I can understand.

"In the course of six or eight years, if daily attended to, the elongated bone of the heel, which is about all that is left of this part of the foot, is brought within a very few inches of the great toe; the broken instep and folded toes are bound together with the ankle in an ugly bunch bulging outward above what seems to be the foot, and the great toe and the heel alone are thrust into the little embroidered shoe, and it is pronounced a perfect lady-foot. The heel is usually an inch or more higher than the toe, and a block of wood is placed in the back part of the shoe to support it. This gives the woman the appearance of walking upon her tiptoes, as she wriggles along, stepping with nervous rapidity, and throwing out her arms to balance herself. A lady with very small feet is obliged to use a cane in walking, or to rest her hand upon the shoulder of a servant, which is a mark of especial gentility.

"The wide and embroidered trousers conceal the unsightly bunch above the shoe, and the uninstructed observer supposes that he is looking upon a tiny but perfectly formed foot. The length of the shoe is really a mere matter of taste. The most fashionable length is, I think, about three inches, although I have a pair in my possession, once worn by a woman in Foochow, which are but two and one-half inches long on the bottom. Of course, so far as any heavy work is concerned, small-footed women are useless; and the housework in families where the women have small feet is always performed by males, or by female servants who have natural feet.

"At first the operation of bandaging is very painful. The bandage is removed every morning; the foot is cleansed, carefully inspected, and then rebound. Of course, before the foot is utterly 'dead,' as it is termed, the quickening of the circulation when the bandage is removed and the severe compression when it is again applied, cause excruciating pain. In the early morning hours the traveler, in moving about a Chinese city, will hear from almost every house the cries of little girls undergoing their daily torture."

There are mothers roaming in the forest, shoeless, hatless, and without other garments than a bark apron and the picturesque designs of the tattooer's pencil, whose solicitude for their children leads

them to compress their heads into cones, or to shape them to a fascinating flatness by the steady pressure of a board against the infant skull. Other mothers, less barbarous, but none the less anxious for the welfare of their little ones, squeeze the feet of their daughters into shapeless masses of bone and gristle, in the firm belief that no young lady can make an eligible bride if her foot exceeds in measure the conventional three inches. Still other mothers, more civilized, and none the less fondly thoughtful of their daughters' interests, base their expectations of a successful career for them as much upon the meager dimensions of their waists as upon the comeliness of their countenances or the brilliancy of their accomplishments.

Some years ago, while engaged in some anthropometric studies among Chinese women and the women of the primitive Indian tribes of Arizona and New Mexico, I was forcibly struck with the marked difference in physical proportion between the savage and the civilized woman. I have made personally, and secured through others, a large number of measurements, which place upon a mathematical basis certain points of difference that are exceedingly pronounced, particularly the large waist of the savage or semi-civilized woman when compared with the highly civilized woman. I have since extended my studies of the subject to the peasant women of various nationalities, particularly French, German, and Italian women, and a single race of East Indian women. Early in the course of my studies, the thought occurred to me that there might be a positive and constant relation between the external configuration of the body and the mal-position of various external organs. I accordingly devised a simple apparatus for the purpose of making outline traces of the figure at any desired angle. With this instrument, I have made a large number of tracings (several hundred in all), and have made a careful study of the position of the abdominal and pelvic viscera in each case.

The following are some of the more important particulars in which the ordinary mode of dress among civilized women, especially constriction of the waist, results in physical injury : —

1. Downward displacement of all the abdominal and pelvic organs, and numerous functional and organic diseases growing out of this disturbance of the static relation of these organs.

2. Lack of development of the muscles of the trunk, which by long

compression and disuse, to a very large degree lose their functional activity, resulting in relaxation of the abdominal walls, weakness of the muscles of the back, general physical feebleness, and destruction of the natural curves of the body, which are not only necessary for health, but also essential to physical grace and beauty, and the development of many bodily deformities, such as drooping shoulders, flat or hollow chest, sunken epigastrium, straight spine.

3. An ungraceful and unnatural carriage of the body in sitting, standing, and walking.

4. An abnormal mode of respiration.

The idea that a displaced stomach can be a possible cause of disease or inconvenience may be new to some, nevertheless, the researches of Glenard, Bouchard, Dujardin-Beaumetz, and other eminent French physicians, have shown beyond room for doubt that displacement of the stomach, bowels, kidneys, liver, and other abdominal viscera, may be productive of the most pronounced disturbance of health and a source of great inconvenience.

Compression of the waist necessarily involves displacement of the organs occupying this portion of the trunk. The unyielding character of the chest walls and the resistance of the diaphragm prevent any considerable displacement in an upward direction. Consequently, the necessary result of waist-compression, either by the corset or by tight bands, is, that the liver, stomach, bowels, and other organs occupying this zone of the body, are carried downward. The same compressing force which diminishes the circumference of the body at the waist, interferes with the normal activity and development of the muscles which form the anterior wall of the lower trunk, so that they offer little resistance to the displacing force applied at the waist.

Bad Positions.— Certain parts of the muscular system suffer seriously from the results of bad positions assumed in the different attitudes which may be taken in lying, sitting, standing, and walking ; to these we wish to call especial attention.

Bad Positions in Sleeping.— As we spend one-third of our time in bed,—at least most persons should do so,—it is of great importance that the right position should be assumed, so that no injury may be received through prolonged constraint in an injurious position. Another fact of importance which is worthy of consideration here is that the process of repair goes on much more rapidly during sleep than at other times,

and since the greater share of deposit of new material takes place at this time, it is obvious that any evil arising from an incorrect attitude will be rendered more or less permanent, the individual growing out of shape during sleep.

We regard the old-fashioned bolster, not yet out of fashion, we are sorry to say, as a most injurious article. When surmounted by a pillow, as it invariably is, the position designed for the head is elevated so high that the sleeper cannot possibly put himself into a physiological position if he attempts to use them. If he lies upon his back, he is sitting half upright, and his spine is curved posteriorly. Fig. 57. If he lies upon either side, the spine will be bent at a dangerous angle. Fig. 58. We have no doubt that thousands of cases of lateral curvature of the spine have been produced by sleeping with the head too much elevated.

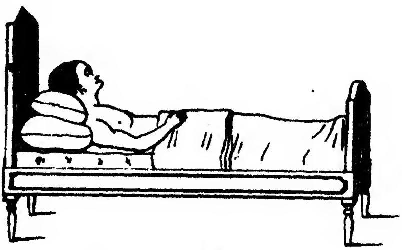


Fig. 57. Improper position in sleeping.

A correct attitude in sleep is with the head and spine as nearly as possible parallel with the central line of the body. If the individual lies upon the back, no pillow at all, or a very thin one at most, should be employed. If he lies upon his side, a somewhat thicker pillow may be used, but only of sufficient thickness to raise the head to the axis of the body. Under no circumstances should bolsters be employed. The side seems to be the most natural position in which to lie in sleeping, and the right side should be chosen by preference, especially by those who eat late before retiring, as this position favors the passage of the food from the stomach through the pylorus.

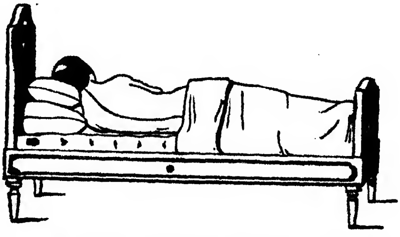


Fig. 58. Improper position in sleeping.

Improper Attitudes in Sitting.—This subject we have already considered in part under the head of Hygiene of the Bones, and would refer the reader to the remarks there made. It must be added, however, that the distortions of the spine produced by improper positions in sitting are only in part due to the changes produced in the cartilages of the

spinal column, which have been pointed out. At the same time that changes in the cartilage discs are being made, changes are also taking place in the numerous muscles of the spine. When the body is bent out of its proper shape, while certain muscles are contracted, others are

Fig. 59.

Fig. 60.

stretched beyond their natural length. If the tension is maintained but a short period, the natural elasticity of the muscle restores it to its natural length again, and so brings the body into proper position; but if it be prolonged, the tonicity of the muscular fibres is in some degree lost. They give up their elasticity and become abnormally lengthened without power to return fully to their natural position. At the same time, the muscles which are contracted while the curved position is maintained, become by the exercise stronger than their antagonizing muscles, which are at the same time being weakened by want of use and abnormal stretching. Thus the evil results are doubled, and the curvature which was at first a mere temporary evil becomes permanently fixed in the body by unequal muscular contraction.

Fig. 61.

Figs. 59, 60, 61, 62, and 64, show positions which are very commonly assumed by students and others. The figures explain themselves at a glance. Many other bad positions are common, not a few of which are undoubtedly due to the improper construction of chairs, sofas, school seats, and desks. In many instances in schools, large students are placed in seats which are too low for them (see Fig. 60), and which require or at least strongly incline them to lean forward while engaged in their studies, making them round-shouldered and narrow-chested. It

is probable, however, that the opposite error is much more common, and is certainly much more injurious, viz., placing small students in seats which are too large and too high for them. When this is done, several evils result. The feet not being properly supported, the weight of the limbs constantly drags upon the spine, and requires that its muscles be kept con-

Fig. 62.

Fig. 63.

stantly in contraction, and at a disadvantage. The desk being too high, in writing the arm must be lifted so high as to unavoidably produce curvature of the spine by elevation of the shoulder. Other evils are also almost certain to follow, among which are disturbances of vision from holding the book too near the eyes, disturbance of the circulation, especially in the lower extremities, due to unnatural pressure on the under side of the limbs, and nervous affections from the unnatural strain upon the sensitive spine from the want of support to the limbs.

Another evil very common in the construction of seats for school-children is placing the desk too far away from the seat (see Fig. 64), thus not only inviting but actually obliging the pupil to lean forward in writing, drawing, or ciphering. This evil is of no small consequence, and we are glad to see that it is being remedied by some manufacturers. Still another common failure is neglect to so shape the backs of seats as to enable them to support the spine at its weakest point. This latter evil is probably as great a cause of curvature as any. The spine becomes tired from want of proper support, and the pupil leans over to get relief. We are glad to know that these difficulties, which have been recognized for several years, but have not been remedied on account of the failure of manufacturers to adapt their seats to the physiological wants of those who were to occupy them, need no longer

exist on this account. Much attention has been given within the last few years, to the construction of school seats, and it is now possible to secure seats which are proper and healthful in construction. Care is necessary, however, on the part of teachers and parents to see that students have at school both seat and desk of proper height, and suitable chairs for the children at home. The growing years of childhood are the plastic years of life, in which the body is molded into the shape which it assumes the most frequently and for the longest periods of time.

Fig. 64. This cut shows the distorted and unhealthful position which a student is almost compelled to occupy by the old-style school seat.

Students, and others as well, often assume most improper attitudes while pursuing their studies at their rooms, tilting their chairs back and placing the feet against the wall, upon the top of the table, or in some other elevated place. Such a position cannot be long maintained without discomfort, and discomfort is simply an admonition of nature to take a different attitude, to change the position.

As a rule which may be universally followed, we know of no better than the simple one, "sit gracefully." A graceful position is a natural one, and will be productive neither of inconvenience nor injury. We grant that there are great difficulties in the way, since very few chairs are constructed on physiological principles; but this is a matter which should receive attention in purchasing furniture. It is possible to obtain

chairs which are reasonably correct in construction. The principal points which need to be looked at are the following:—

1. A chair should be so constructed that it will properly support the back, not by one or two slats placed crosswise, but by a uniform curve, corresponding as nearly as possible with the natural curve of the spine. The whole spine should be supported without requiring a person to

Fig. 65. This is a representation of a seat which encourages a correct attitude.

throw the shoulders forward in order to bring the lower or middle part of the spine in contact with the back of the chair.

2. It is also important that chairs should be of proper height, so that the weight of the limbs may be supported by the feet set squarely upon the floor instead of hanging upon the front edge of the chair. Nearly all chairs are made too high, if not for the adult persons in the family, for nearly all the younger members, who most of all need seats properly constructed. There should be chairs of different heights for different members of the family; and the importance of the matter is sufficient to justify the incurment of the expense necessary to secure each member of the family against injury from this cause.

While we are by no means inclined to be ultra upon the subject, we must enter a word of protest against the too common use of rocking-

chairs. As usually constructed, they induce an improper attitude in the occupant, one which limits the action of the lungs and produces roundness of the shoulders. We seldom sit in a rocking-chair for a half-hour without finding it necessary to get up and walk about, expanding the chest and filling the lungs to relieve the feeling of oppression which results from the confinement of the chest. We have frequently observed in patients suffering with lung troubles a careful avoidance of rocking-chairs, and upon making inquiry have found that what we say is true. They avoided the rocking-chair because with their diminished lung capacity they could not breathe well while sitting in it.

While the rocking-chair is undoubtedly a comfort to thousands, we have no doubt that on the whole it has been a curse to the race, especially to womankind. We may have easy chairs, made as soft and luxurious as possible; but let them be made in accordance with physiological principles. Art has made the models for chairs rather than nature. If we would follow art less and nature more in numerous ways we should be vastly better off.

Fig. 66. Improper position in standing, the shoulders being thrown forward.

Fig. 67. A correct position in standing.

Bad Positions in Standing.—See Figs. 66 and 67. While there need not be so much said on this subject as on the former, a few points deserve attention. It should be remembered that the muscles are required to act while we are standing as well as when walking or making active movements. It requires a constant exercise of a large number of muscles, particularly those of the trunk, to keep the body erect, to prevent it from toppling over. Hence it is important, especially for those whose occupations require a standing position much of the time,—as clerks, accountants, bank cashiers, etc.,—that correct attitudes should be preserved, so that the muscles may

act properly. It is a very common practice with many to throw the weight wholly upon one foot, alternating with the two feet. When this is done, the spine is curved, and parts are thrown greatly out of their natural position. The weight may be easily alternated without so great changes; and when this is done, all the benefit which can be derived from any change of the sort is obtained. The rule should be to always preserve the body erect, the chest held forward, the hips held well back, and the chin properly drawn in. The arms should swing freely by the sides. Avoid an awkward and stiff appearance.

How to Walk.—It may seem at first ridiculous to pretend to teach grown people how to walk, as though they had not learned this in infancy. But we are willing to venture the assertion that not one person in twenty knows how to walk well. How few people are there who do not feel slightly embarrassed when obliged to walk across a large room in which are many persons seated so as to observe well each movement! How many public speakers there are who appear well upon the platform so long as they remain standing still, or nearly so, but who become almost ridiculous as soon as they attempt to walk about. Good walkers are scarce. As we step along the street, we are often looking out for good walkers, and we find them very seldom. What is good walking? We answer, Easy, graceful, natural walking. Nearly all the good walkers there are, will be found among gentlemen, since fashion insists on so trammeling a woman that she cannot possibly walk well, can scarcely make a natural movement, in fact. To walk naturally, requires the harmonious action of nearly every muscle in the body. A good walker walks all over; not with a universal swing and swagger, as though each bone was a pendulum with its own separate hanging, but easily, gracefully. Not only the muscles of the lower limbs, but those of the trunk, even of the neck, as well as those of the arms, are all called into action in natural walking. A person who keeps his trunk and upper extremities rigid while walking, gives one the impression of an automaton with pedal extremities set on hinges. Nothing could be more ungraceful than the mincing, wriggling gait which the majority of young ladies exhibit in their walk. They are scarcely to be held responsible, however, since fashion requires them to dress themselves in such a way as to make it impossible to walk otherwise than awkwardly and unnaturally.

We cannot attempt to describe the numerous varieties of unnatural gaits, and will leave the subject with a few suggestions about correct walking.

1. Hold the head erect, with the hips well held back, the chest forward, and the chin drawn in. Nothing looks more awkward and unprepossessing than a person walking with the head thrown back and the nose and chin elevated.

2. Step lightly, with elasticity, not with a teetering gait, setting the foot down squarely upon the walk and raising it sufficiently high to clear the walk in swinging it forward. A shuffling gait denotes a shiftless character. But do not go to the other extreme, stepping along like a horse with "string halt." A person with a firm, light, elastic gait, will walk much farther without weariness than one who shuffles along. A kind of measured tread or rhythm in the walk also seems to add to the power of endurance, though, for persons who have long distances to travel, an occasional change in the time will be advantageous.

3. In walking, do not attempt to keep any part of the body rigid, but leave all free to adapt themselves to the varying circumstances which a constant change of position occasions. The arms naturally swing gently, but not violently. The object of this is to maintain the balance of the body, as also by the gentle swinging motion to aid in propelling the body along.

Correct walking should be cultivated. It ought to be taught along with the arts and sciences. In our military schools it is taught; but these schools can be attended by but few. Invalids especially should take great pains to learn to walk well, as by so doing they will gain more than double the amount of benefit they will otherwise derive from the exercise.

Relation of Food to the Muscles.—While this is not the proper place for a complete account of the subject of food as related to the muscles, we may well notice a few points. Experiments show very clearly that the muscles are wasted by work and exercise of all kinds requiring muscular effort. Equally careful and reliable experiments have determined the fact that the muscles need for their support, certain elements of food more than others; these are the nitrogenous elements. The muscles are themselves nitrogenous substance, and hence they require elements of the same character. It is as impossible to nourish the muscles or supply them with force from starch, sugar, or

fat alone, as it would be to make a brick house out of wood. They need gluten, albumen, fibrine, caseine, and similar nitrogenous elements. It is not necessary to eat animal food to obtain these elements, though they are contained in greatest abundance in animal tissues. Vegetable food, such as oatmeal, peas, beans, and the unbolted meal of all the grains, contains a large proportion of this class of food elements. It is observed, in fact, that in the meal of wheat we have exactly the right proportion of all the food elements necessary to nourish the body and maintain it in health. This fact is also established by the dietetic customs of various nations who use little or no animal food with the exception of milk, and that in moderate quantities. Thousands of persons have been muscle-starved from the attempt to live upon fine-flour bread, which contains very little more than starch, and has been proven by experiment to be incapable of supporting the life of a dog.

The athletes of ancient Greece and Rome were not reared on fine-flour bread; and it is equally worthy of notice that prize-fighters, wrestlers, and all persons in training for feats requiring the highest physical development, avoid fine-flour bread, and make graham bread, oatmeal, cracked wheat, and such food, a large proportion of their diet. Thus fully does experience corroborate the conclusions of theory in this matter.

Studies of dietetics which have recently been made, show that the cereals are of all foods the richest source of muscular power when used as foods. A muscle depends for its energy upon the consumption of sugar, which is chiefly formed from the starch, or farinaceous elements of the food. One of the champion wrestlers of the United States has for a number of years furnished a practical example of the correctness of this view, which is based upon theoretical deductions as well as experimental evidence, by confining himself almost wholly, while in training, to granola and other cereal foods manufactured by the Sanitarium Health Food Company, of Battle Creek, Michigan. This gentleman, when in training, takes no flesh food of any sort, and carefully avoids the use of condiments of every kind, living upon the plainest of food, consisting wholly of cereals and ripe fruits. He attains the highest results of training more easily and quickly by living upon these excellent cereal foods than upon any other diet. The same observations have been made by brain workers. Sir Isaac Newton subsisted exclusively upon a diet of cereals when working out his mathematical discoveries.

THE NERVOUS SYSTEM.

ANATOMY OF THE BRAIN AND NERVES.

The structure of the nervous system is the most complex and delicate of any part of the body. Many portions of it, indeed, are not yet perfectly well known, although many physiologists have devoted their whole lives to careful study of this part of the human organism. We shall not attempt to give any except the most thoroughly established facts, devoting little space to the consideration of complicated and disputed questions connected with the subject.

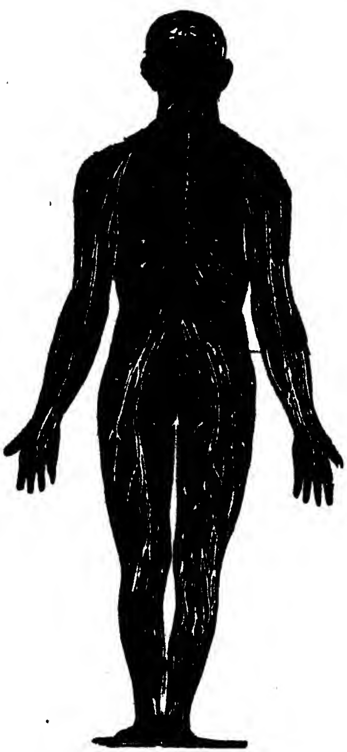


Fig. 68. A general view of the nervous system.

Structure of Nerve Tissue.—The microscopical characters of nerve tissue we have already considered. We found that there are two distinct elements in nerve tissue, cells and fibres. The essential element of both of these we found to be the same, the central part of the fibre being but a continuation of the cells, both being composed of the great basis of all forms of living matter, protoplasm.

These two elements of the nervous system are differently distributed in the body. The cells are collected in groups in the central parts of the body, which are termed *ganglia* while the nerve fibres, associated in bundles, ramify to every part of the body. So completely is the whole body permeated by these delicate filaments occupied in transmitting sensations and volitions, that if all the other tissues were removed, the nerves would still present an exact outline of the body.

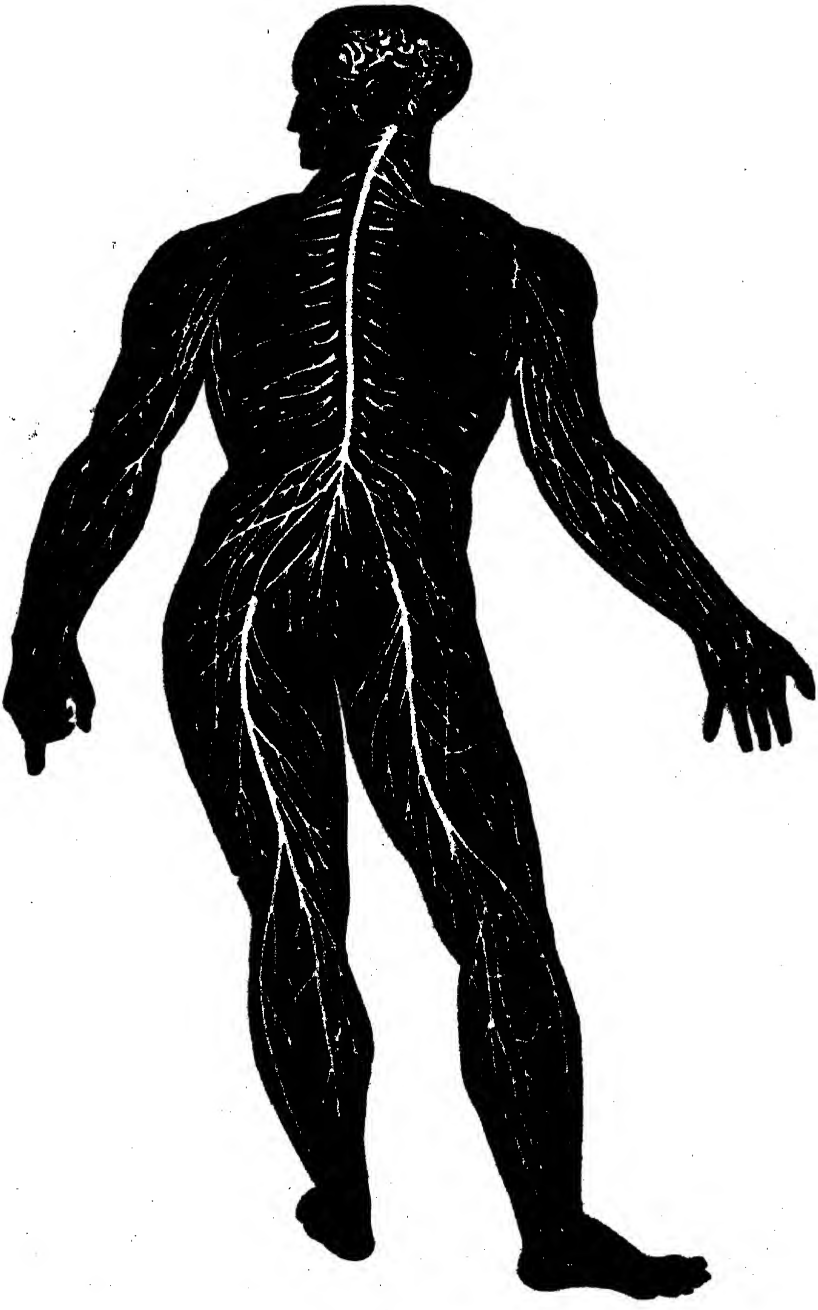


PLATE III.—*THE NERVES.*

Divisions of the Nervous System.—Considered from the standpoint of function, the nervous system is divided into two classes, each of which has a distinct work to perform; viz., the *cerebro-spinal* system, and the *organic* or *sympathetic* system. The first mentioned is that with which we have most to deal, because this is the one which chiefly distinguishes man and animals from vegetables, and the higher functions of which distinguish man from lower orders of animals. The second class or system of nerves presides over the nutritive functions of the body, the processes of growth and repair, excretion, secretion, etc., which are sometimes termed the *vegetative* functions because of their close analogy to similar functions in vegetables, although in the latter class of existences there is nothing analogous to a nervous system.

Fig. 69. The Brain and Spinal Cord.

Fig. 70. A view of the upper surface of the brain, exposed by turning back the scalp and removing a portion of the cranium.

Description of the Cerebro-Spinal System.—The cerebro-spinal system is made up of ganglia and nerve trunks. The ganglia, or groups of cells, are chiefly to be found in the skull and spinal canal, constituting the brain and spinal cord, the central axis of this system, the nerve trunks emanating from these two great centers and extending to all parts of the body. See Fig. 69.

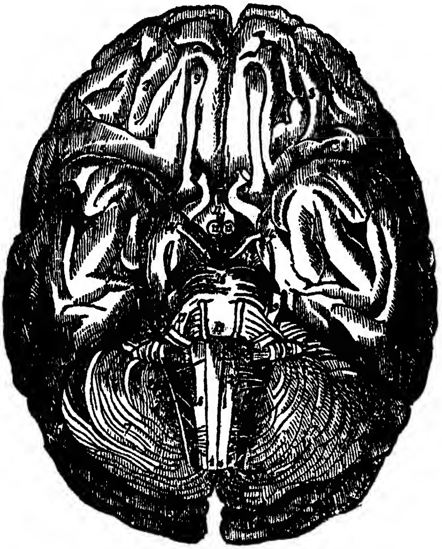


Fig. 71. A view of the under surface of the brain, showing the origins of the several pairs of nerves.

Structure of the Brain.—See Figs. 70–73. The brain is the largest mass of nervous matter in the body, filling the entire cranial cavity. Its weight is about forty-nine and one-half ounces in males, and forty-four ounces in females. It is inclosed by two membranes, the outer of which is closely applied to the inner plate of the skull, and from its toughness called the *dura mater*. This membrane abounds in blood-vessels, from which nourishment is supplied to both the brain and the skull, and by means of which the blood-supply of the interior and exterior of the cranium is in communication. Next the brain is another delicate membrane chiefly made up of blood-vessels which run down into the substance of the brain. Between this membrane and the *dura mater* is still another membrane so delicate in its structure that it has received a name which describes it as being like a spider's web.

The membranes of the brain divide it into a larger and a smaller portion. The larger portion, located in the upper and front part of the skull, is called the *cerebrum*; the smaller portion, located in the back and lower part of the skull, is called the

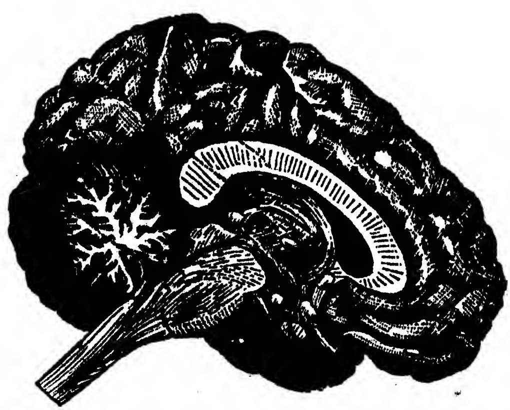


Fig. 72. The left half of the brain, showing the convolutions of the cerebrum, one lateral ventricle, the *arbor vitæ* of the cerebellum, etc.

cerebellum, or little brain. Each of these principal portions of the brain is subdivided by a fold of the membranous coverings into two lateral halves, each of which furnishes nerves to the opposite half of the body.

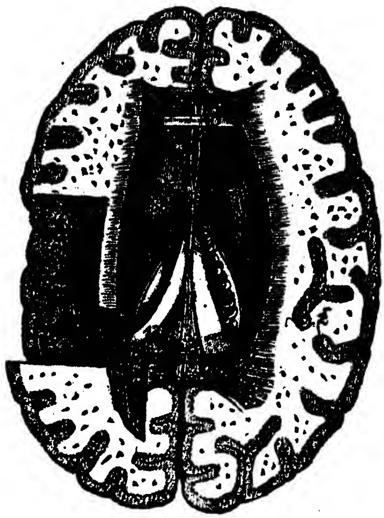


Fig. 73. A horizontal section of the brain through its middle portion, showing the relation of the white matter to the gray, with many other points of interest.

When the membranes of the brain are removed, its surface is found to be marked by numerous and quite deep depressions, which are due to the convolutions or foldings of its outer layers. The gray color of the mass is also noticeable. When cut, it is found that the gray substance extends but a little way into the mass of tissue, the central portion being white. Examination with a microscope shows that the gray substance is composed of nerve cells, while the white portion is made up of fibres, which are connected with the cells.

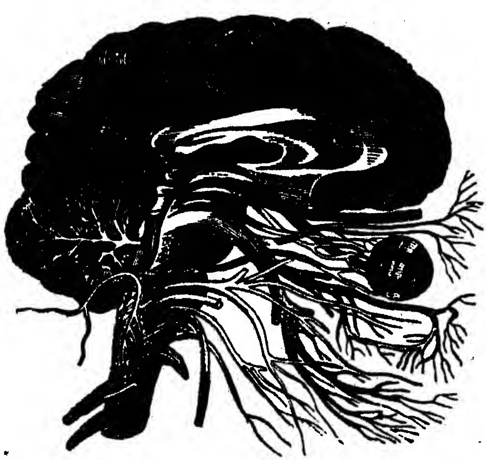


Fig. 74. A view of the Cranial Nerves, with their points of origin in the brain.

At the base of the brain, or its under side and central portion, are found a number of collections of gray matter or nerve cells, called the *central ganglia* of the brain.

At the lowest portion of the brain, just at its junction with the spinal cord at the *foramen magnum*, is a rounded body, known as the

medulla oblongata, which may really be considered as the enlarged upper end of the spinal cord.

In the central portion of the brain is found a curious little organ about as large as a pea, the *pineal gland,* which the great philosopher Descartes supposed to be the seat of the soul. It is now known to be simply a gland.

From this exceedingly brief description it will be seen that the brain is really a collection of ganglia within the skull, and consists of several distinct groups of cells. Each group has its particular function to perform, its particular part of the work of the vital economy to control or direct. From each one go out nerve fibres which terminate in different ways, according to the functions to be performed.

The Spinal Cord.—The spinal cord, or marrow, as it is sometimes called, is really a continuation of the brain down through the spinal canal. It extends through the whole length of the canal, and at its lower extremity spreads itself out like the tail of a horse, whence it is in this region called the *cauda equina.* The spinal cord is really a series of cell groups, or ganglia, ranged one above another, but so closely joined together as to make them practically inseparable. Like the brain, the cord is invested by membranes designed for its protection and nourishment. Like the brain, also, it is divided into two lateral halves, each half being further divided into anterior and posterior columns. All along its course the cord sends off branches, which have two roots, one of which arises from the anterior column, and the other from the side of the cord, branches being sent off symmetrically from both sides.

The Cerebro-Spinal Nerves.—The nerve branches which are sent out by the brain and spinal cord number forty pairs in all, of which nine pairs originate in the brain, and thirty-one in the spinal cord. See Figs. 74 and 69.

The thirty-one pairs of nerves which are derived from the spinal cord are distributed chiefly to the trunk and extremities, all parts of which they supply with nerves of sensation and of motion. The nine nerve branches from the brain, arising chiefly from the central ganglia at its base and from the *medulla oblongata,* are distributed to the face, the organs of special sense located in the head, and the vital organs of the chest and abdomen.

The manner in which nerves and nerve cells are connected is now pretty well understood, though it has been but recently that the exact

mode of connection has been determined. It will be recalled that nerve cells are provided with peculiar appendages, some possessing but one, others two, three, or even as many as a dozen or more. It appears from careful investigations that have been made of this subject that these poles, or branches, are for the purpose of connecting the individual cells; and also, that nerve fibres are simply prolongations of these same appendages. By this means the minute cells of the brain and spinal cord are actually extended into the most remote portions of the body; and the millions of cells which make up the gray matter of the brain and cord are connected by the same means.

Fig. 75. A view of the Sympathetic, or Organic Nervous System.

The Sympathetic, or Organic System of Nerves.—Fig. 75. This system is made up of a series of small ganglia found in the head and on either side of the spinal column within the cavities of the trunk. The ganglia are all connected by small fibres, so that they are sometimes spoken of as being a single nerve, *the great sympathetic.* Their fibres follow the blood-vessels in great numbers, starting with them as they go out from the heart. A large collection of the nerves of this system, found in the abdomen just back of the stomach, is known as the *solar plexus.* This system is closely con-

nected with the cerebro-spinal system of nerves by means of communicating branches.

General Properties of Nerves.—Nerves possess, during life, the power to do two things: to conduct nerve force, and to conduct impressions received from without. Both these properties are not possessed by the same nerve fibres at the same time. For doing the two kinds of work there are two classes of nerves. They do not differ in the least in structure, but totally in function. One carries impressions into the brain and spinal cord; the other transmits nerve force in the form of impulses outward. As there are many varieties of impressions to be received, there are several kinds of nerves which have power to transmit impressions only of one certain kind. These are called nerves of special sense. This property of nerves is known as nervous irritability. Each nerve of special sense possesses only its own kind of irritability. For instance, the nerve of sight transmits impressions of sight, but not of hearing, smell, taste, or any other kind of impression. So with each of the others. The nerves which travel outward from the nerve centers end in the muscles,—where they are called *motor* nerves,—in membranes, glands, and in all parts requiring the aid or control of the nerves.

PHYSIOLOGY OF THE BRAIN AND NERVES.

The chief organ in the nervous system is the brain. This is the great center from which emanates the nerve force which vitalizes and energizes every part of the body. It is the seat of government in the vital domain, the nerves being its servants through which it receives information of the external world, and by means of which it is able to execute its mandates in all parts of its province, even extending beyond itself and the limits of the body, and operating upon external things through the medium of its instruments.

As before stated, the brain is made up of a series of ganglia, each of which has special duties to perform. We can only understand the functions of the brain as a whole by studying the functions of each of the separate groups of cells which compose it. This has been done with the greatest care, and very recently results have been obtained which throw great light on this hitherto most complex and mysterious subject. So far as we know, these results have not yet been embodied in any treatise on the subject, and are to be found only in sci-

entific periodicals. An eminent writer* in a leading English scientific magazine, the *Nineteenth Century*, has summarized these late results so admirably and succinctly that we cannot do better than to quote a portion of his article, as follows:—

"The most important step in modern research, and which may be said to have ushered in a new period in our knowledge of brain function, was the application of electricity to the hemispheres of the brain of living animals, and the observation of the effects caused by such stimulation. The first successful experiments of this kind were made by two German observers, Fritsche and Hitzig, of Berlin, who were soon followed by Ferrier in this country. A secure base was thus given to one of the most important doctrines of the present day, viz., *the localization of the several cerebral faculties;* and if vivisection had done nothing else for science, it would simply on account of this have a claim on our gratitude. But vivisection is only one of the means which have been employed toward the elucidation of our subject. The clinical features of the several diseases of the brain have been, and are now, more attentively than ever studied by hospital physicians; the symptoms observed during life are compared with the results of post-mortem examinations; and by simultaneously bringing anatomy, experimental physiology, clinical medicine, and pathology to bear upon this great question, the present doctrine of brain-function eventually became established."

Functions of the Medulla Oblongata.—"We may subdivide the brain into five principal parts, which greatly differ in general configuration, and which, although they are in the most intimate connection with each other, yet are invested with thoroughly different functions. They stand in the relation of higher and lower centers, the lowest being the medulla, and the highest the gray surface of the hemispheres. The functions of these parts will now be considered *seriatim*, beginning with the lower centers.

"1. The *medulla* forms the connecting link between the spinal cord and the brain. It is a small cord, about an inch long, and weighing no more than two drachms; yet it must be looked upon as the most vital part of the whole system, for injury to it proves immediately fatal. The most important function of the medulla is to cause and to regulate the respiratory movements, and the point in which

*Dr. Julius Althaus.

this respiratory center is situated is called the *vital knot.* Death by hanging results generally from injury to this special point in the medulla, through dislocation or fracture of the upper portion of the spine; the criminal therefore dies of asphyxia, or cessation of respiration. The entire brain above the medulla may be removed in an animal, and the latter may yet continue to breathe; but destruction of the medulla asphyxiates it at once. The same organ also regulates the heart's action. It is true that the pulsations of the heart are not, like the respiratory movements, at once arrested by destruction of the medulla, for they may continue for some time after death from hanging. Indeed, the rhythmic beating of the heart is effected by means of small nerve cells which are situated in its muscular substance, and which may retain their energy for some time after death. The influence of the medulla upon the heart is therefore a secondary one, that is, to retard or accelerate its action. The medulla is never at rest as long as life lasts; for respiration and the heart's action continue during sleep as well as in the waking condition in a typical manner.

"The medulla is likewise the center of action for the blood-vessels. These are not always equally distended by the circulating liquid, but may contract and dilate, as is seen in sudden blushing and pallor, under the influence of diverse mental emotions. The insensible perspiration of the skin, which, like respiration, is also going on constantly, is likewise under the influence of the medulla.

"A pointed illustration of these facts is given by the symptoms of the peculiar disorder known as sun-stroke. This affection occurs more particularly in the tropics, but is occasionally observed in hot weather in the temperate zone, in persons who are exposed to the direct rays of the sun, and who have at the same time to undergo exertion. It is therefore chiefly seen in soldiers marching during the heat of the day, or in agricultural laborers who are at work in the fields; yet it has been known to come on at night, in persons sleeping in the pestilential atmosphere of overcrowded and badly ventilated barracks or cabins, and in children shut up in a stifling bedroom after having been exposed to great heat during the day. It would therefore be more appropriate to speak of heat-stroke, for the disorder really consists of a great and sudden rise in the temperature of the blood, which in this state acts as a poison on the medulla. The perspiration of the skin is suddenly arrested, and as the evaporation of sweat on the surface of the body is intended to produce cold, and thus to neutralize the effects

of the external heat, the closure of this safety-valve causes a further rise of temperature, which paralyzes some or most of the centers in the medulla. The worst kind of heat-stroke is that in which the centers for respiration and the heart's action are affected, as fatal asphyxia or syncope is the result. A person who may be walking in the street or working in a field is seen suddenly to drop down as if shot or struck by lightning, and dies in a minute or two. A fatal issue is in such cases so rapid that there is no chance for any treatment to do good, more especially as the means which would be of the first importance, viz., ice and plenty of cold water, are usually not at once at hand.

"The second kind of sun-stroke is owing to paralysis of the center for the blood-vessels in the medulla, whereby apoplexy is caused. In such instances the symptoms are not quite so sudden, and death may often be averted. The illness begins with mental disturbance—there are delusions and hallucinations, followed by mania, and the patient may commit suicide or homicide. This stage of excitement lasts for a short time, and is succeeded by a period of depression. The patient becomes sleepy, insensible, and may die in a state of profound apoplexy. Life is, however, often saved by drenching the body with cold water, and applying ice to the head. The overheated blood is thereby cooled, and the medulla roused from its torpid condition.

"The movements of swallowing, which require for their proper execution a co-ordinated action of the lips, tongue, palate, and gullet, are likewise under the immediate influence of the medulla. The same organ contains a center for the physiognomical play of the muscles of the face, and another for articulate speech, that is, the pronunciation of vowels and consonants in such fashion as to form words. These facts are well illustrated by the symptoms of a peculiar disease which, although it has no doubt always existed, has only recently attracted the attention of the medical world, and which consists in a wasting away of those nerve cells in the medulla which preside over the functions just mentioned. This affection, which has received the euphonious name of 'labio-glosso-pharyngeal paralysis,' commences with apparently insignificant symptoms. It is found that speaking, eating, and swallowing require an effort. The tongue feels heavy; the lips do not move properly; the patient experiences difficulty in pronouncing certain letters, such as *b*, *p*, *o*, and *u*; he cannot whistle or blow out a candle. As time goes on, the tongue becomes more powerless;

more letters of the alphabet are lost; the soft palate does not act properly, and the voice acquires a nasal twang. The vocal cords become paralyzed, the voice is completely lost, and the patient is only able to grunt. He cannot blow his nose, clear his throat, cough, or swallow. In attempting to eat, the tongue fails to form a proper morsel of the food taken, and to push it on to the gullet. The food remains, therefore, between the teeth and the cheeks, and can only be pushed farther on to the throat by the aid of the fingers. It is apt to get into the windpipe and cause choking. On attempting to drink, the liquid returns through the nose. The unfortunate sufferer thus dies a slow death from starvation, the torments of which can only inadequately be relieved by medical aid. On making a post-mortem examination, wasting of certain nerve cells in the medulla is discovered to be the cause of this terrible malady.

"All these different functions of the medulla which we have considered are automatic or mechanical, that is, independent of volition, intelligence, or any other of the higher mental processes; and they may therefore continue where the higher centers in the brain have been either experimentally removed, or disorganized by disease."

Functions of the Pons and Optic Lobes.—"2. The next great division of the brain which we have to consider consists of the *pons*, or bridge, and *optic lobes*, and is the center for still more complicated actions than those over which the medulla presides. The functions of these parts have been chiefly made known by experiments on living animals. A pigeon which is left in possession of these parts, but from which the higher portions of the brain have been removed, is still able to respond to a stimulus, but, if left alone, will show complete indifference and loss of initiative. There is no desire, no impulse to any spontaneous action, and apparently no recollection of any former events. Such an animal will remain, day by day, sitting quietly on its feet, without giving any signs of life, and, unless artificially fed, will ultimately die of starvation, without feeling the pangs of hunger and without suffering in any way. As soon, however, as its repose is disturbed, it will give signs of life. If laid on the back, it will struggle until it has regained its previous position on the feet. If pinched, it will walk away. If thrown into the air, it will flap its wings, and come down to the ground in the ordinary manner. If a light be held to the eyes, the pupils will contract. If ammonia be applied near the nostrils, the animal will draw back with signs of disgust. If a shot be fired close

to it, it will jump up and open its eyes; and if food be put into its mouth, it will swallow it.

"In frogs and fishes the phenomena are almost identical with those observed in pigeons, being only slightly modified by the different media in which the animals live. In the fish, for instance, the contact with the water acts as a constant external stimulus on the mechanism of swimming. A fish from which the higher portions of the brain have been removed, will therefore not sit still, like the pigeon, but will go on swimming until it reaches an impediment to its passage. It follows a headlong and apparently irresistible impulse, yet will show some method, inasmuch as it will avoid obstacles, and turn aside when prevented from going straight on. While a fish in its normal condition will, as may daily be seen in an aquarium, stop on its way, sniff about, pursue a prey, etc., the unbrained fish sails heedlessly along, without ever stopping or taking nourishment, until it dies of exhaustion. In a similar manner an unbrained frog, when thrown into the water, will move on until it reaches *terra firma,* but, as soon as it has found a resting-place, will remain in the same state of death-like repose as the pigeon.

"In the mammalia the results differ somewhat from those obtained in the lower animals. In them the different portions of the brain are so intimately connected, and so dependent upon one another, that removal of the higher parts appears to disorder the entire mechanism, and causes such a degree of exhaustion as to interfere greatly with the independent action of the lower centers. Nevertheless, the functions of these latter are identical with those of the same parts in the lower animals, which we conclude from their homologous structure, and also from observations made in disease of these centers.

"The expression of the affections, such as fear, terror, pleasure, pain, etc., is likewise under the influence of the second division of the brain. Frogs, in which the higher portions of the brain have been destroyed or removed, will still croak when stroked across the back; and croaking in the frog is the expression of satisfaction and comfort. In ourselves, laughing and crying, and other expressions of the affections, are generally quite involuntary, and independent of reflection. It is true, that we may, by an effort of the will, restrain or inhibit such expressions; but this is done by a special exertion of the inhibitory influence of the higher centers, which can only come into play after a long course of training, and which is quite absent in children and uneducated persons."

Functions of the Cerebellum.—"3. The *cerebellum*, or little brain, which is intimately connected with the preceding and following divisions, was formerly believed to be the seat of the reproductive faculty and desire ; but this view has recently been shown to be incorrect. Nor has the cerebellum anything to do with reason, volition, or consciousness ; for animals which are deprived of the higher centers, yet left in possession of the cerebellum, do not show any spontaneity of desire or action, and will, for instance, die of starvation with the utmost indifference. If, however, the cerebellum be removed, the animal will move about as if it were drunk. It is not paralyzed, and will endeavor to carry out certain movements, but there is an utter want of precision; and even the most desperate efforts do not succeed in steadying the body. The cerebellum is thus shown to be the organ of equilibration of the body ; and this conclusion from physiological experiments has been corroborated by observations of disease of the organ in man. It is likewise known that the different portions of the cerebellum have different parts allotted to them in this respect. One part prevents us from falling forward, another from falling sideways, and from constantly turning round in a circle, while a third is intended to secure us from falling backward."

Functions of the Central Ganglia.—"4. The *central ganglia*, which constitute the fourth great division of the brain, have the function to render certain complex movements which are intimately connected with sensations, and which are, in the first instance, only excited by volition and consciousness, gradually as it were, mechanical and automatic. The object of this contrivance is to save time and trouble to the highest portion of the brain, viz., the gray surface of the hemispheres. It is intended that these latter should only be occupied with the most important manifestations of life. The central ganglia may therefore be said to be the confidential servants or private secretaries of the hemispheres, and undertake a good deal of drudgery, in order to leave the gray surface at liberty for the finer and more difficult kinds of the work which falls to our lot in life. Thus we have in childhood and youth to learn the actions of walking, talking, writing, dressing, dancing, riding on horseback, decent eating and drinking, singing, playing of musical instruments, etc., by countless conscious efforts on the part of the hemispheres ; and full attention is necessary in the beginning in order to enable us to carry out such movements in a proper manner. But the older we grow, the

more frequently we have directed our minds to all these forms of activity, the less effort will eventually be necessary on the part of consciousness and volition; and ultimately all such movements will be performed mechanically, and without much, if any, attention to them on the part of the gray surface of the brain. A man who is in the habit of writing much never thinks of the way in which he forms his letters on the paper, over which his pen seems to fly quite mechanically. The same holds good for the various kinds of needlework, embroidery, playing on the piano, the violin, etc. If, each time we do anything of that sort, a conscious effort were necessary for all the different parts of which the action is composed, the time at our disposal would not suffice for the hundredth part of the work which we actually get through in life; and some forms of activity, such as finished piano and violin playing, would be utterly impossible.

"A key is thus furnished for the comprehension of many singular occurrences which would otherwise be quite inexplicable. A pianist, for instance, finds himself playing one of Rubinstein's sonatas by heart, and is perhaps thinking at the time of his coming trip to Switzerland, or something else which may happen to engage his attention; that is, the central ganglia play the sonata, while the hemispheres are busy elsewhere. A very worthy country parson told me some time ago that, when he reads prayers at church, he does so quite as an automaton, for his mind keeps wandering in a totally different direction. A man who knows London well may walk from his house through a maze of streets with the greatest precision to his club, where he arrives without having given the slightest attention either to the act of walking or to the direction he took, but having been quite in another world of thoughts all the time he was on his way.

"Somnambulism and other automatic conditions, which are observed in certain states of derangement of the nervous system, may be similarly explained. The lower centers are habitually under the absolute control of the highest, that is, the hemispheres; yet this balance of power may be temporarily disturbed by illness or exhaustion of the gray surface, and the central ganglia may then begin to act in their own fashion. What may take place under such circumstances may be aptly compared to certain occurrences which are not uncommon when the family is out of town, and the servants are left in charge of the house. Supposing the hemispheres to have lost their control over the lower centers, elaborate actions may take place which may have all the appearance of delib-

erate intention, and yet for which the person who commits them can no more be held responsible than the absent master of the house for the misdoings of his servants. The somnambulist who falls from the roof of a house and is killed is no more a suicide than a man who in the state of epileptic vertigo commits robbery, arson, or murder, can be called a truly responsible criminal. The legal mind has not yet been able to grasp the full significance of these facts, as shown by convictions to penal servitude of persons who should have been sent to hospitals or asylums."

Functions of the Cerebrum.—"5. The highest development of brain-matter is found in the *hemispheres, convolutions,* or *gray surface of the brain,* which is the material base of all mental and moral activity. This portion of the brain * * * * * is not a single organ, as was formerly supposed, but consists of a number of thoroughly differentiated organs, each one of which possesses certain functions, yet is in the closest possible connection with all the others. To define all these various organs with accuracy, to determine their intimate structure as well as their individual energy, and to trace the physiological and pathological alterations which they undergo during the natural processes of development, maturity, and decay, and in diseases to which they are subject, is the greatest problem for the anatomy and physiology of the twentieth century; and when this problem is solved, a complete revolution in psychology must be the result. At present, however, we are only on the threshold of this inquiry, which is perhaps the most difficult and complicated of any which may present themselves to the human mind.

"I cannot attempt, in the limits of the present paper, to enter at all fully into the labyrinth of these convolutions, but must be satisfied with a rapid survey of what is best known with regard to the functions of some of them. One of the most suggestive results of recent researches has been to show that the faculty of intelligent language, as distinguished from simply articulate speech, is situated in that portion of the hemispheres which is called the third left frontal convolution, and its immediate neighborhood. We have already seen that the pronunciation of letters and words is effected in the lowest portion of the brain, viz., the medulla; but this and all the other inferior organs concerned in speaking form only as it were the instrument on which that small portion of the brain's surface which I have just named is habitually playing. Lower centers are able to hear spoken words, and to see written words; but the intelligent appreciation of the connection which exists between

words and ideas, and the faculty of expressing thoughts in sentences—that is, what the Greeks called *logos*—only resides in the third left frontal convolution. This discovery was foreshadowed by Gall, but actually made by Broco, who likewise found that the left hemisphere is altogether more important for intellectual manifestations than the right, and is chiefly trained for talking as well as most of the finer kinds of work which we have to perform in daily life. This appears to be owing to the following circumstances: The left hemisphere is originally heavier than the right; the convolutions are more abundantly developed in the left; and finally, the left is more abundantly provided with blood, on account of the larger caliber of the blood-vessels which supply it. Most people therefore train chiefly the left hemisphere for talking, writing, etc.; they are left-brained as they are right-handed. A preponderance of the right over the left hemisphere, on the other hand, seems, according to the most recent researches, to be characteristic of certain forms of insanity.

"Physiological experiments on animals point to the convolution I have just named as being concerned in language; for when electricity is applied to the part in the living monkey or rabbit, the animal opens its mouth, and alternately protrudes and retracts the tongue. But far more convincing proofs have been furnished by numerous cases of disease in which there was loss of language during life, and where after death a lesion limited to the part just named was discovered.

"A boy, aged five, who was a great chatterbox, fell out of the window and injured the left frontal bone, which was found depressed. There was no paralysis, but the boy had entirely lost his language. The wound healed in twenty-five days; but the child, although intelligent, remained dumb. A year afterward he was accidentally drowned, and at the autopsy it was found that the third left frontal convolution had been destroyed by the injury he had received.

"A man fell with his horse, but got up, took hold of the reins, and was going to jump into the saddle, when a doctor who happened to accompany him expressed the wish to make an examination. It was then found that he could not speak, but had to make himself understood by pantomime. A small wound in the left side of the forehead was found, with depression of bone; but there was no paralysis. Inflammation set in, the patient died, and at the post-mortem examination it was found that a fragment of bone had penetrated into the third left frontal convolution, which had become softened.

"Talking, writing, drawing, etc., are habitually done by the left hemisphere alone, while both hemispheres have to be trained for musical performances. Pianists educate them both equally, while violinists and violoncello-players have to train them dissimilarly; and this is probably the reason why it requires more practice, and is more difficult, to play well on string-instruments than on the piano.

"A man who has by disease or injury lost the faculty of talking, is generally also unable to write; and it is only in exceptional cases that one of these functions persists while the other is in abeyance. Cases of this latter kind show, however, that there are really two separate centers for the two faculties which are lying very close together, and therefore generally suffer at the same time. If the disease affecting them be still more extensive, the faculty of intelligent pantomime or gesticulation is likewise abolished. Persons who have entirely lost their language may still be able to play chess, backgammon, and whist; and they have been observed to cheat at cards with some ingenuity; they may also be sharp in business matters,—facts tending to show that speech and intellect do not run in identical grooves.

"Those portions of the hemispheres which correspond to the parietal region, or crown of the head, and which are called the *parietal lobes*, constitute the true motor region of the brain's surface, and, being in intimate connection with another portion which is the material base of the intellect and mind, have been called *psycho-motor centers*, in order to distinguish them from the lower motor centers in the medulla, the central ganglia, etc. The special functions of these psycho-motor centers have been studied by the application of electricity, by destroying them in the living animal, and also by observation of certain symptoms at the bedside; and it has been shown that each one singly serves some definite purpose, as, for instance, clenching the fist, swimming, grasping something, raising the hand to the mouth, etc. Destruction of these centers causes paralysis of such movements, while irritation of them leads to a peculiar form of epilepsy, in which the convulsions affect only one (the opposite) side of the body, and where there is generally no loss of consciousness.

"The next great division of the brain's surface is that which corresponds to the temporal region of the skull. These *temporal* lobes of the hemispheres are intended to act as centers for sensory perceptions. This is likewise shown by galvanizing them in the living animal, and by localized destruction of the same. One portion of the

temporal lobe is the center of the sense of hearing. If it be destroyed, deafness on the opposite side is the result; on the other hand, if it be electrified, the animal is seen to prick up its ears and to assume the attitude of listening, just as it does when a sudden noise is made close to its ear. In those animals whose habits of life render their safety dependent upon the keenness of their sense of hearing, as, for instance, the wild rabbit and the jackal, galvanization of that part causes not only pricking of ears and listening, but also a quick jump to the side, as if to escape from some danger which would be announced by a loud or unusual noise.

"The center for the sense of smell is situated close by. If it be electrified, the animal begins to sniff, as if it smelt something strong, just as it does when odoriferous substances are placed to its nose. Destruction of this center causes loss of smell. It is particularly developed in animals which are endowed with a keen sense of smell, such as dogs, cats, and rabbits. A center for the perception of taste is in its immediate neighborhood. Other portions of the temporal lobes are intended for the sense of touch, and there is also a visual center, destruction of which causes blindness of the opposite side. All these centers are symmetrically arranged on both sides, the left in the brain serving for the right side of the body, and *vice versa.*

"A third portion of the hemispheres which we have to consider are the *posterior* or *occipital* lobes, which correspond to the back of the head. Their structure differs greatly from that of the parts more in front, and they receive their blood supply from quite a different set of blood-vessels. Electricity has apparently little effect upon them, and destruction of their substance causes paralysis, neither of general sensation, nor of motion. Animals from which these lobes have been removed continue to hear, touch, taste, smell, and move nearly as well as usual. Their sight is impaired. They generally, however, refuse to eat, and succumb rapidly. We are inclined to look upon these lobes as especially connected with the digestive tract, more especially the stomach and liver, and also with the reproductive organs; yet the symptoms of disease of these lobes are contradictory and perplexing, and our knowledge concerning them is as yet in its infancy.

"The last and most important portion of the hemispheres consists of the *anterior* or *frontal* lobes, which correspond to the forehead. They are the actual seat of the intellect. Injury or disease of these lobes does not cause any impairment of motion or sensation; and large

portions of brain-matter have occasionally been lost through wounds in these parts without any very striking symptoms, such as paralysis, etc., following, more especially if the lesion was confined to one side. Patients have now and then recovered from the most fearful injuries to the anterior lobes, and yet been able to go about and to attend to the ordinary routine of certain occupations; but it has always been shown, on close examination, that there had been a profound change in the character and behavior of such persons, and that their temper and their mental and moral faculties had become deteriorated. In a very marked case of this kind, which occurred some years ago in a previously steady and clever workman, there was, after recovery from the injury, such a change in the mind of the man that his employers had to discharge him. The balance between his intellectual faculties and his animal propensities had evidently been destroyed. He had become capricious and vacillating, fitful, impatient, obstinate, and, as far as intellectual capacity was concerned, appeared to be a child, which, however, had the animal passions of a strong man. In consonance with such cases is Ferrier's experience with monkeys in whom he had destroyed these lobes. The animals did not appear to have lost the power of motion or sensation, but there was an alteration in their character. While previously to the operation they were actively interested in their surroundings, and pried into everything which came within their sphere, they had after it become dull and apathetic, readily dozed off to sleep, or wandered to and fro in a listless manner; so that it was evident that they had lost the faculty of attentive and intelligent observation.

"The anterior lobes have therefore to be looked upon as the organic base of the highest intellectual and moral faculties. The principal part of the work done in life consists of certain movements or actions, which are the more or less immediate consequence of sensations and desires which we experience; but apart from the power of performing such actions, we possess the faculty of restraining or inhibiting them in spite of being urged to their performance by sensations or desires. This inhibitory action is again most intimately connected with the power of concentrating attention, without which none of the higher intellectual operations are possible. The anterior lobes are therefore inhibitory centers, intended for the highest kind of mental work and moral control. They are small in idiots and the lower animals, larger in monkeys, largest in man; and their pecul-

iarly large and abundant development is found to coincide with the highest development of intellectual power.

"It is probable that a special evolution of certain parts of these lobes will be found to coincide with the presence of certain special aptitudes and talents in individuals; but of this nothing definite is known, and there is in this direction an immense field still open for patient and intelligent inquiry."

The Functions of the Spinal Cord.—The spinal cord contains both gray and white matter, the gray matter consisting of nerve-cells and the white matter of nerve fibres. The function of the nerve-cells seems to be to have charge of certain automatic movements which are performed independent of the will, or involuntarily. These movements are generally termed reflex, since they are supposed to originate in external impressions which cause an impulse to be carried to the spinal cord by a sensory nerve, the impulse being reflected to the muscles by a motor nerve. This is well seen in a frog which has been decapitated. If a little sulphuric or acetic acid be applied to the inner portion of the thigh of a frog which has just been deprived of its head, it will immediately put up the other foot to remove the irritating substance. If the acid is applied to the belly instead, both feet will be raised, and vigorous movements will be made to remove it. If placed upon its feet, such a frog will remain perfectly quiet if wholly undisturbed; but as soon as any sort of irritation is applied, as tickling with a stick, pricking, or even jarring of the object on which it rests, it will leap forward as though alive. These movements are said to be reflex because they are supposed to originate in the manner described, from the gray matter of the cord. There are eminent physiologists who maintain that experiments of this kind prove that the cord as well as the brain is the seat of mind, even going so far as to assert that mind exists wherever gray matter is found, being a property of nerve-cells.

The spinal cord also acts as a conductor of sensations to the brain, and of volitions from it. The nerves of general sensibility convey to the spinal cord impressions received in various parts of the body, when they are carried up to the brain by means of the gray matter of the cord. The brain then wills the performance of an act, and the force necessary to excite the muscles to contract is sent down the spinal cord and thence out through some of its nerve branches to the part from whence the impression came. For instance, if a pin is thrust into the finger, the sen-

sation which we call pain is transmitted by means of a sensory nerve to the cord, which passes it up to the brain, where the sensation is really felt, the brain itself not being sensitive, since it may be cut and torn without pain, though it appreciates injuries done to other parts of the body. The cord is thus seen to be both a conductor of nerve force and a nerve center or force generator.

The reflex action of the cord is often seen in human beings in cases of paralysis in which there is loss of power to control the lower extremities. We have frequently met with such patients, in whom the limbs could be made to twitch with considerable force by titillation of the soles of the feet, though the muscles would not act in obedience to the will on account of some injury in the nerve centers having charge of that part of the body or in the nervous communication between the two.

Functions of the Spinal Nerves.—The thirty-one pairs of nerves which originate in the spinal cord are each double. This might be easily surmised from the fact already stated, that each nerve has two roots, one of which arises from the posterior portion of the cord, the other from the anterior portion. It has been found, by experiments upon animals, that the fibres which come from these two roots differ from each other in function, the anterior roots being nerves of motion, and conveying nerve force from the cord to the muscles, and those which are connected with the posterior root conveying impressions from various portions of the body to the cord. Hence the anterior root and fibres arising from it are termed motor, the posterior root and its fibres being called sensory.

A curious fact discovered by physiologists is that both the motor and sensory fibres, which, as we have seen, communicate with the brain through the cord, cross over to the opposite side from that on which they enter the cord before passing into the brain. The sensory fibres pass over or decussate soon after entering the cord, while the motor filaments cross over in the medulla oblongata, or at the base of the brain. The consequence of this is that if an injury happens to these nerve fibres in the brain or the cells in which they terminate or originate, the injury will be manifested upon the opposite side of the body. Thus, paralysis of one side of the body may be taken as evidence that the opposite side of the brain has been injured. A few fibres do not cross over.

Functions of the Cranial Nerves.—The functions of the nine cranial nerves are far less simple than those of the spinal nerves just described. In some instances a nerve has both motor and sensory functions, but in several others a nerve has but a single function. Several

of the cranial sensory nerves, instead of possessing general sensibility, have peculiar sensory properties, from which they are termed nerves of special sense. The *optic*, or nerve of sight; the *auditory*, or nerve of hearing; the *olfactory*, or nerve of smell; and the nerves of taste are those which possess special sensory properties, and these possess little or no general sensibility.

The fifth nerve should be specially noticed as the great sensory nerve of the face, since it is disease of this nerve which is the occasion of so much suffering in *tic douloureux*, or facial neuralgia. A branch of this nerve supplies the teeth, and hence it is that decayed or diseased teeth are so frequent a cause of facial neuralgia.

Functions of the Sympathetic System.—The name of this system of nerves very well indicates its general character. Besides having charge of the nutrition of the body, its vegetative or organic functions, it connects or associates together the different parts of the system, so that when one member suffers, the others suffer with it. A good illustration of the action of this system is seen in a simple experiment performed by Dr. Brown-Sequard. He observed that when he placed one foot in cold water, the other became warmer. In one instance the temperature of the foot not immersed rose seven degrees. The reason of this is that nature makes an effort to resist the effects of the cold applied to one foot, by increasing the supply of heat; and through the sympathy of the other foot, its heat is also increased.

The very common phenomena of "taking cold," and numerous other instances of sympathy of one part with another, are due to the action of the sympathetic nerves.

The Mind.—Whatever may be the correct doctrine respecting the nature of the human soul, about which science can really say very little, it seems very clear from what has been proven respecting the nature of the brain and its processes, that mind is nothing more nor less than brain action. It is everywhere granted that the brain is at least the organ of the mind. It is certainly relevant to inquire, then, Is not the relation between the mind-organ and the mind analogous to the relation known to exist between the organ of digestion and digestion? Digestion is a process; thought is a process. Digestion is the result of the action of the digestive organs; there is abundant reason to believe that thought, or mind, is the result of brain action. This view need not interfere with any theological views concerning the nature of the soul, since it

is evident that whatever the soul is, it is something more than mind; it must be greater than mind, since mind is only a result, from whatever standpoint we look at it. Whatever there may be behind which we do not understand, and there is doubtless a great deal, mind is still the same, only a result; and it may as well be considered as the result of brain action as of the action of any other cause. If we deny this regarding man, we must do the same respecting the brute, since he also has a mind, and is capable of thinking, willing, and reasoning to a certain degree. Perhaps we cannot do better than to quote the following paragraph from one of the foremost thinkers of the age, and one of the most distinguished writers on this subject, Dr. Henry Maudsley, of London:—

"It must be distinctly laid down that mental action is as surely dependent on the nervous structure as the function of the liver confessedly is on the hepatic structure; that is the fundamental principle upon which the fabric of a mental science must rest. The countless thousands of nerve cells which form so great a part of the delicate structure of the brain, are deemed to be the centers of its functional activity; we know right well from experiment that the ganglionic nerve cells scattered through the tissues of organs, as, for example, through the walls of the intestines, or the structure of the heart, are centers of nerve force ministering to their organic action; and we may fairly infer that the ganglionic cells of the brain which are not similarly amenable to observation and experiment, have a like function. Certainly they are not inexhaustible centers of self-generating force; they give out no more than what they have in one way or another taken in; they receive material from the blood which they assimilate, or make of the same kind with themselves; a correlative metamorphosis of force necessarily accompanying this upward transformation of matter, and the nerve cell thus becoming, so long as its equilibrium is preserved, a center of statical power of the highest vital quality. The maintenance of the equilibrium of nervous element is the condition of latent thought—it is mind statical; the manifestation of thought implies the change or destruction of nervous element. The nerve cell of the brain, it might in fact be said, represents statical thought, while thought represents dynamical nerve cell, or, more properly speaking, the energy of nerve cell."

Almost any amount of testimony might be added on this point, but this will suffice. It is readily granted that there are some difficulties, even with this view of the nature of mind; but it is claimed

that the difficulties with this view are much less than with any other, and that they are not insurmountable. The view deserves attention, at least; since if it be true, it is destined to overturn many of the old philosophies in psychology. Indeed, it may almost be said that the old philosophies are already abandoned by the majority of the clearest thinkers, on account of the great numbers of difficulties which attend them.

The Mechanism of Thought.—Explained in accordance with the scientific theory of mind, the mechanism of thought loses much of its complexity, as we may be able to see. According to this view, thought really originates in the external world. The eye, ear, organs of touch, smell, and taste, and other sense organs, receive impressions from the external world, each carrying to the brain the particular kind of impression which it is fitted to convey. The eye conveys impressions of light, the ear of sound, etc. These impressions are received through the medium of the nerves by certain groups of cells lying at the base of the brain which are designed for this purpose. One group receives impressions of light, and of all the sensations which can be received through the eye. It can receive these kinds of impressions, and no others. The same may be said with respect to each of the other senses. The special organs or ganglia, which receive these impressions, transmit them through connecting branches to the intellectual part of the brain in the cerebrum, where they are recognized as light, sound, odor, etc., and this is thought. In this way, ideas respecting the size, form, color, and other properties of objects, are formed. If the ganglia at the base of the brain convey to the cerebrum the impressions which they are in the habit of doing, without being excited to do so by the external agents upon which they are dependent, the result is the same. If action of the ganglia which preside over the organ of sight is excited and the cerebrum informed of the fact, the individual will receive the perception of light even if no light is really seen. Action of this sort may be excited in a variety of ways, as by mechanical irritation or by the use of electricity. Every one who has received a severe blow upon the head, as by a fall upon the ice, is aware of the fact that concussion of the head will cause a person to see flashes of light. A story is told of a man who in an English court testified to having seen a man who assulted him in the dark by the light produced by a blow on the head which he received from his assailant. It is not stated whether the testimony was received or not.

Of course it could not be true, since light thus produced is not real, having no existence except in the brain. We have many times produced the same phenomena by the application of a current of electricity to the head. Distinct flashes are seen, though the eyes are closed. From this it appears that the impression we call light is in the brain due to action of certain nerve cells. The same experiment may be made with all the other organs with a like result. Ordinarily, seeing is the reception of light-waves through the medium of the eye, which is an organ specially constructed to receive them, by which means the optic nerve is made to convey an impression of a certain sort to the cells in the brain set apart for the reception of such impressions, which are thereby induced to act, the action being recognized by the cerebrum, the seat of the intellect, as light. If the optic cells are made to act in any other way, the result is the same, as we have seen. It is very evident, then, that so far as the external world is concerned, all knowledge respecting it comes to the brain through the organs of sense, the only avenues of communication between the brain and the outer world. A careful analysis of our stock of knowledge will show that it all relates to things of which we have gained information by means of our senses; that is, all our knowledge is made up of, or derived from, data collected for us by the eye, ear, touch, and other sense organs. If this is not clearly seen at once, it will be by the supposition of a case. Let us imagine a person born into the world without a single one of the seven senses. It is inconceivable that such a person could have a single thought. The life possessed would be but a vegetative one. The brain would necessarily be an utter blank, since it would be without the most simple materials for thought; there would be no means by which the intellectual machinery could be set in motion.

We have not space to elaborate this subject further, and here leave it for the consideration of the reader, hoping that those who are prepared to appreciate the questions at issue will continue their investigation of the nature of mind and the relation of mental activity to the brain and nerves.

The Will.—That power of the mind by which the voluntary acts of the body are determined or controlled is termed the will. This is undoubtedly the highest function of the brain, since all other of both the bodily and mental functions are in some degree subject to it, either directly or indirectly. While this is probably the most obscure of all

the questions connected with the physiology of the brain, there are some very interesting facts known concerning it which are well worthy of consideration.

First, as to the nature of the will. This has been the subject of lively discussion among physiologists and metaphysicians for centuries. We hear much about *free* will; yet when we come to study the manifestations of volition, we find that they are far from possessing that degree of freedom which the generally accepted doctrines on the subject would lead us to suppose. If we carefully analyze an act of volition, we shall find that desire is the prompting impulse in most if not all cases. When we act, it is because something which we regard as valuable to ourselves or some other being is to be gained by so doing; in other words, we act because it is desirable to do so, or seems to us to be desirable. We always do what at the moment seems to be best, whatever its ultimate consequences may be, and irrespective of our knowledge of the consequences. When we refrain from action, it is because we *desire* to do so. Thus will may be manifested in two ways, positively and negatively, in acting and in refraining from action; but in both instances the prompting of will is desire. This fact seems so clear that we apprehend no one will dispute or disagree with it who will stop to reason candidly on the subject.

If we examine into the nature and origin of desire, we shall find that it grows out of a complex combination of circumstances and influences, first of which may be mentioned, inheritance. Our mental and physical constitution is largely the result of the habits and education of our parents and ancestors for many generations back, together with special circumstances governing our early development. As Dr. Oliver Wendell Holmes has very well said, "Each of us is only the footing up of a double column of figures that goes back to the first pair. Every unit tells, and some of them are *plus*, and some *minus*." The proofs of this are too numerous to need citation here.

Again, our desires are in a great degree the result of our education. Our tastes change with changes in our circumstances. They are modified by age, and by our associations and social surroundings. Our desires are influenced by those of our friends, by the books we read, by the food we eat, by the condition of our bodily health, and by a great variety of circumstances. It is obvious, then, that as the will is excited to action by desire, it is far from being wholly *free*, since it is indirectly so dependent on other influences and circumstances.

We are well aware, also, that the will is greatly modified by disease. A person who in health is active, energetic, positive in all his movements, becomes while suffering from some indisposition, the very reverse. A fit of sickness, a pecuniary loss, or other misfortune, will not infrequently change a person's disposition and the character of his will manifestations, for life.

A careful study of the relation of the will to the body will show that its domination is far less complete than is usually supposed. It has no power over the functions of organic life, as of the heart and blood-vessels, the stomach, intestines, and other vital organs, and it is fortunate for us that it has not, as the uncertain action of the will—it being so readily affected by a great variety of causes—would be fatal to the healthful and harmonious action of the vital machinery. Even the power of control of the so-called voluntary movements is only acquired by degrees and after a protracted effort. In this respect, man is inferior to some lower animals. The little child learns to walk by painful and laborious efforts. At first it cannot control the muscles necessary to effect locomotion. It can readily understand what movements must be made, long before it can acquire the power to make them. The beginner in piano-playing fully appreciates the difference between knowing how to do, and doing. The will calls upon certain muscles to act, but they will not until they have been trained to do so. This fact is further seen in the great difficulty of making separately movements which have by habit been associated, as for example, closing one eye while keeping the other open; or moving one hand back and forth in a horizontal plane while the other is being moved in a vertical plane, both palms looking downward. It is, indeed, sometimes impossible for us to control our mental operations by the will. We cannot think of what we wish to. We cannot on all occasions concentrate our minds upon the subjects of which we desire to think. The mind will wander into other fields; other and widely different subjects of thought will occupy its attention in spite of the most vigorous efforts of the will to the contrary. We cannot command the brain to stop thinking. It will not obey if so commanded. We cannot even compel it to stop thinking upon any special subject which may be occupying it, except by displacing it by some other idea, which may be in turn again displaced by the original thought before we are aware of it.

Without further argument it must be evident that the will is by no means wholly free, but that it is, in a very large degree at least, the re-

sult of the operation upon us of the various external influences with which we are surrounded.

Physiologists have never been able to locate the will in any particular organ of the brain. It is probable that it exists in immediate connection with each of the various cerebral centers: in other words, that each group of cells which receives nerve fibres from the outside of the body and sends back motor fibers, possesses its own volition, the will being the sum total of action of all these volitionary centers.

Memory.—Memory is that faculty or property of the brain by means of which we are enabled to accumulate knowledge. To say that all of the problems involved in a complete explanation of memory may be easily solved, would be claiming too much. This much seems pretty certain, however, viz., that memory is due to the fixing of impressions in the structure of the brain. This view harmonizes perfectly with all the known facts relating to this most valuable function of the mind. Every impression received, occasions an action of certain parts of the brain. As changes of substance are constantly taking place in the brain, it is but natural to suppose that cells which are acting will be modified in accordance with the particular manner in which they are acting, their structure being thus modified by their action. If this were the case, it would follow that the longer the action were continued the more intense would be the impression made upon the structure of the cells acting, and the more lasting. This is exactly what does happen. The longer an object is viewed, the longer the memory of it remains. The things and places which are often seen and become very familiar to us are seldom forgotten.

Again, if this theory is correct, it would follow that the larger the number of cells brought into action by an impression as associated with it, the more intense and lasting would be the impression. This, too, is undoubtedly true. We much better recollect things that we both see and hear, than those which we simply see or hear. Objects that we not only see and hear but are also able to touch, taste, smell, and otherwise investigate, we retain in mind the most accurately and the longest. In fact, the great secret of a good memory is concentrated attention and association of many senses and faculties in observation. By this means we gain the advantage of the memory of several different organs or cell groups by which to recall the object or fact which we wish to remember.

This theory also explains the phenomena of habit. By frequent ac-

tion in a certain way the structure of the nerve cells which command the action becomes so modified that they act more readily in that particular way than in any other. This fact, if it be true, and there seems hardly a chance to doubt it, is certainly very suggestive of the importance of cultivating right habits of thought, speech, and action, since the task of remodeling a deformed and distorted brain is an exceedingly difficult one.

Blushing.—The sudden reddening of the cheeks known as blushing, is due to the influence of certain emotions upon the *vaso-motor* center, that is, the part of the brain which controls the blood-vessels of the body. In some persons, blushing is wholly confined to the cheeks, while in others it extends to the forehead, and in still others to the neck and shoulders. Through the influence of mental emotions the walls of the blood-vessels become relaxed, causing an unusual afflux of blood to the part, which imparts the characteristic redness. An experiment sometimes performed by physiologists upon white rabbits illustrates the phenomenon of blushing and explains its mechanism. In the white rabbit the skin is white, and so transparent that changes in the blood-vessels can be as readily noted as in human beings. Placing the animal under the influence of ether, the experimenter divides the nerve which controls the circulation in the ear. The result is that the ear immediately becomes flushed; in fact, it blushes. If the nerve is prevented from uniting, by removal of a portion of it, the flushing will continue, and, in consequence, in the course of a few months it will be found that the ear affected by the operation has grown to be appreciably larger than the other, in consequence of its larger supply of blood.

Pain and its Uses.—Pain is simply a modification of general sensibility. It arises from excessive irritation or stimulation of the nerves. Thus, the same irritation which in moderate degree, or when of short continuance, is agreeable, giving pleasure, when rendered more intense, or even if long continued, becomes exceedingly painful. For example, the sense of contact of bodies with the skin is not unpleasant, and is often very agreeable; but when the contact is made in a peculiar manner, as in titillation, it may become painfully unpleasant. Light is pleasant and grateful to the eye in a moderate degree, but becomes very painful and unbearable when we attempt to look at the sun.

Pain is useful as a warning of impending evil. It puts us on our guard by informing us that the tissues are in danger of being injured in some way. Although unpleasant to bear, and often an unwelcome vis-

itant, pain is a guardian, a faithful sentinel. If it were not for the warnings and admonitions we receive from this source, we would speedily subject the delicate organism to such violence as to impair its functions, if not entirely destroy its utility. This fact is well seen by the accidents to which persons are exposed who are in any way deprived of this means of warning. For instance, a person who had through disease lost the sense of feeling in his lower extremities, in taking a foot bath put his feet into water so hot that the feet were badly burned, being actually parboiled. A gentleman of our acquaintance who had lost the sense of feeling in one arm by an accident in which the sensory nerves of the arm were divided, while at work on a cold day unconsciously froze the fingers of the affected hand so badly that death of the tissues took place and considerable portions were lost. Other similar instances might be cited. The warnings of pain should always be heeded. Nature makes no unnecessary complaints. While it is not wise for a person to be on the lookout for pains, magnifying every uncomfortable sensation, it is important that the timely admonitions of beginning disease should be carefully heeded. Neglect of this often sacrifices useful lives which might easily be saved with timely attention. Pain, then, should be looked upon as a beneficent provision of nature rather than as an enemy.

The great physiologist, Magendie, makes the following interesting remarks concerning the nature of pain:—

"Though it may appear like sophistry to say that pain is the shadow of pleasure, yet it is certain that those who have exhausted the ordinary sources of pleasure have recourse to causes of pain, and gratify them by their effects. Do we not see in all large cities that men who are debauched and depraved find agreeable sensations where others experience only intolerable pain?"

We have seen old topers whose sensibilities had become so depraved and benumbed that the strongest liquors failed to excite them, fill a wine-glass with peppersauce, and quaff the liquid fire as though it were a glass of milk or the mildest claret.

Numerous experiments and observations show that the capacity for pain increases with the fineness of the organization. It is pretty clearly settled that lower animals suffer much less from the same injury than man. Indeed, it is maintained by some that in the lowest orders, as in worms and reptiles, there is little if any sensibility to pain, the contortions arising from injury, being really reflex in character. It is notice-

able that savages are less sensitive to pain than civilized persons.

Sleep.—Sleep is a physiological condition in which there is cessation of activity of the upper lobes of the brain. In sleep, the blood leaves the brain to a large extent, the membranes becoming pale and the activity of the nerve cells ceasing in consequence. Upon waking, the blood returns again very quickly. This fact has been observed not only in animals, but in human beings in whom large portions of the skull have been removed by accident. During perfectly sound sleep there is no action of the thinking cells of the brain. There may or may not be some degree of activity of the central ganglia, the sensational centers, so-called, at the base of the brain, but there will be no degree of activity in the cerebrum.

Dreams never occur in perfectly sound sleep. They are an indication that there is not complete cessation of activity in the cerebrum. The will being dormant, the various faculties act in an irregular, disorderly manner, giving rise to a great variety of absurd, grotesque, inconsistent mental pictures. It has been remarked that dreams are the best index to a person's character, since they are really but the echoes of our waking thoughts. The superstitious confidence which many persons put in dreams is in the highest degree unphilosophical, and has not a shadow of evidence in its favor. Late eating and deficient physical exercise are the most common causes of bad dreams, which are also a symptom of disease.

Somnambulism.—The habit of walking about while asleep is one of the most curious of all the phenomena of nervous action. The somnambulistic state is simply an exaggeration of the state of dream. It is a condition in which the intellectual faculties are dormant, while many parts of the brain seem to be even more active than usual. While in this curious state, persons will accomplish feats which would be impossible for them while awake.

Many remarkable instances of somnambulism are recorded. For example, a story is told of one Cortelli, who "was found one night asleep in the act of translating from a dictionary. When his candle was extinguished, he arose and went to seek another light. When any one conversed with him on any subject on which his mind was bent at the time, he gave rational answers, but he seemed to hear nothing that was said to him or near him on other subjects. His eyes also seemed to be only sensible to those objects about which he was immediately engaged, and were quite fixed; so much so, that in reading he turned the whole head from side to side instead of the eyes."

Another very remarkable case is related by the Archbishop of Bordeaux in the "Encyclopedia Methodique." "It was concerning a young priest at the Catholic seminary, who used to rise in his sleep and write sermons. Having written a page, he would read it aloud and make corrections. 'I have seen,' says the Archbishop, 'the beginning of one of his sermons which he had written when asleep; it was well composed.' . . . . . He continued to write, although a card was held between his eyes and the paper. Did the history stop here, we should have a well-authenticated case of vision without the aid of the eyes. But the collateral circumstances show that this writing was accomplished, not by sight, but by a most accurate mental representation of the object to be attained. For after he had written a page requiring correction, a piece of blank paper of the exact size was substituted for his own manuscript, and on that he made the corrections in the precise situation which they would have occupied on the original page. A very astonishing part of this report is that which relates to his writing music in this sleeping state, which it is said he did with perfect precision. He asked for certain things, and saw and heard such things, but *only* such things, as bore directly upon the subject of his thoughts."

There seems to be a very close relation between the somnambulistic and the mesmeric state. In both there is voluntary action, though the will does not seem to be fully dominant, since movements appear to be in a considerable degree automatic.

Mesmerism.—The secret of mesmerism appears to be in getting the will of the subject inactive, and then putting his sensational centers in operation through the medium of the senses. We cannot imagine that a person could be mesmerized who could not hear, see, or feel. From a somewhat careful study of the nature and phenomena of mesmerism we are convinced that at least the greater share of the manifestations, if not the whole, can be explained in this way. At least, we have never seen manifestations which could not be thus explained, without the supposition of any occult force. When a person is to be mesmerized, he is placed under conditions the best calculated to make the will dormant. There must be silence. The subject is usually told to direct his eyes upward, either looking at his hand or at some small, indifferent object which presents few details to furnish fund for thought. After a certain length of time, longer or shorter, according to the individual, in some persons the mind will become va-

cant of thought, the will inactive. The mental organs are then in a condition exactly analogous to that of a scale beam evenly balanced. It is ready to act just according as the impression shall be made, and so nicely adjusted is the balance that only a very slight impression is necessary to turn the scale. The operator then closes the eyes of the subject or tells him to do so, perhaps placing his fingers upon his eyes for a moment. Then he will say to him in a very positive manner, "You cannot open your eyes." The operator does not ask the subject *if* he can open his eyes, but assures him that he cannot. If he finds that the eyes are not opened, he then feels quite sure that his subject is in a condition to be influenced. Then when he tells him to open his eyes, they are opened. He wishes him to appear to be engaged in fishing. He puts into his hands something slightly resembling a fishing-rod, it may be a ruler or a cane. Then he puts into his mind the desired idea by telling him that the object he holds is a fishing-rod. He offers him something and calls it a line, pretends to find the hook and to put a worm upon it, then points in an appropriate direction and says, "There are the fish, see them! throw in your line and catch one." Thus the mind of the subject is influenced by what is said and done to him, what he sees, hears, feels, and otherwise appreciates through his senses. Not all persons can be influenced in this way, simply because their positive mental organization will not allow the mind to become vacant and the will dormant. Persons who are easily mesmerized are those who are naturally easily influenced, whose imaginations are easily excited. A condition very similar to the mesmeric state can be induced in animals as well as in human beings.

The most popular and successful mesmerist at present exhibiting in this country said to us a few months since in a conversation on the subject of mesmerism, in answer to the question whether the subject was not affected wholly through the medium of the senses, "Yes, chiefly so." He endeavored to maintain that there was some degree of direct action of mind upon mind, but was utterly unable to produce an instance in which this was done, even when full credit was given to his own testimony. There is evidence for believing that the cases which seem to illustrate this power of mind are cases of fraud.

Animal Magnetism.—So much has been said upon this subject of late years that we cannot refrain from offering a word upon it, especially as there exist such wide-spread errors concerning it.

The doctrine of an occult force by which one person may operate

upon another, or by which one mind may affect another otherwise than through the medium of the senses, seems to have originated in Paris, in the latter part of the last century, with a pretender whose claims were investigated by a committee appointed for the purpose by the French Academy. Benjamin Franklin, who then resided in Paris, was a member of the committee. After a careful and thorough examination of the claims of the pretender, they were pronounced to be utterly unfounded, it being decided that the phenomena apparently due to the operation of some unseen force, were wholly attributable to the imagination of the subjects rather than to magnetic or any other form of force communicated by the operator.

We firmly believe that this simple explanation was the correct one then, and is correct still. We have never yet seen nor heard of any phenomena of the sort in question which were not fairly attributable either to the imagination or to some tangible cause which could be easily pointed out. A few years ago while studying the medical uses of electricity with one of the most eminent physicians of New York City, who was at that time in charge of the department of nervous diseases at the great Demilt Dispensatory of that city, we had abundant opportunity of testing the matter, and were fully satisfied with the results.

The physician referred to was at that time engaged in a series of experiments in what he termed mental therapeutics. Under the guise of animal magnetism he was experimenting upon the imagination of the patients who came under his care. Not a particle of medicine was used, nor any other remedial agent. The patient was simply made to believe that he was being treated by means of a powerful magnetic current; yet, as the Doctor frequently remarked, *the results were as good as under any method of treatment he had ever employed.* The same method was not adopted in all cases, but was varied according to individual peculiarities, the same general principles being followed, however, throughout the course of experiments. In some instances the patient was allowed to think that the magnetic virtue had been imparted to a certain very bad tasting but inert liquid of which he was, with much solemnity, directed to take exactly one drop once in twenty-four hours, just as the clock was striking twelve, and on no account to take a larger quantity, or to take it at any other time, as the consequences might be something terrible. The effect of infinitesimal doses was under these circumstances decided enough to gratify

the most enthusiastic advocate of high potencies. A solution of nothing in reality but a bad taste, potentized by the imagination of the patient, wrought wonders of which the most successful "magnetic healer" would be proud to boast. Yet there was no chance for the operation of any other force than the minds of the patients themselves. To the influence of the mind upon the body must be attributed all the so-called magnetic cures.

A careful study of the nervous system and of the nature of nerve force makes it very apparent that the only way in which one mind can operate upon another is through the senses. From all we *know* of the mind, its only avenues of knowledge are the seven senses. These may receive impressions from external objects and transmit them to the brain; but there is no other means known by which knowledge of any sort can be imparted. The idea that nerve force can be communicated through any other medium than nerves is not to be entertained for a moment by scientific physiology. The simplest experiments demonstrate the fact that nerve force, volition, mind impulses, or whatever the force may be called, can travel on nothing but nerves. For instance, suppose the nerves which control the hand to be divided. The most powerful effort of the will possible is now utterly powerless to cause the hand to move or to show any sign of obedience to the mind. The ends of the divided nerve may be united by muscular fibre or other living tissue, but still the channel over which nerve force is wont to travel with such rapidity is wholly interrupted. The best conductors of electricity, a force more closely allied to nerve or mind force than any other, may be used to splice the divided ends, but still the result is the same. The divided nerve ends may be pressed together as closely as mechanical contact can be made, and yet there will be no transmission of force beyond the point of division. Before the connection between the brain and the hand can be restored, the ends of the nerve must grow together, there must be a restoration of the continuity of structure which was broken down in the severing of the nerves. When this is done, the nerve resumes its function. The nerve force travels over it with the same facility as before, and the hand is again under the domination of the will. The deduction is a very clear one that if the mind cannot control or in any way influence an organ which is actually a part of the body, through which the same blood flows which circulates in the brain, and the muscular and membranous and bony tissues of which are one with the rest of

the body, the only difference being the division of some of the nerves or force conductors,—if under these circumstances the mind or will is powerless to operate, then how can it be possible that it should have power to affect by mere volition objects which are remote from it, or even objects which may be touched by the outer surface of the body? There can be but one answer to this question. The brain can only operate through the medium of nerves.

But we shall be asked to answer several questions. Perhaps the most frequent query will be, "If this view be correct, how do you account for the magnetic influence which some persons seem to possess by which they can influence an audience so wonderfully, swaying their feelings at will?" We answer, there is no evidence that any person possesses such magnetic power. Individuals often possess wonderful powers of influence, and people differ much in this respect. One man will hold a large audience spell-bound for hours, while another can scarcely keep a half-dozen in their seats until he has finished. The difference consists, not in the possession of magnetism by one and its want by the other, but in the different manner in which the two persons address their hearers. Let the most powerfully "magnetic" speaker stand before an audience of persons who are both blind and deaf, and how much influence could he have over them? Not a whit. He might exert himself to his utmost, he might imagine himself a powerful generator of magnetism, and suppose himself to be throwing out oceans of magnetic force, but the result would be wholly negative. If a force of the kind supposed really existed, the persons situated under the circumstances described would feel its influence as really and as intensely as though they could both see and hear. This simple experiment would settle conclusively the question of magnetism in public speakers, and would make evident the fact that what is termed magnetism in these cases is simply the sum total of the qualities which go to make up a good speaker, especially the gestures, the expressions of the face and attitudes of the body, the quality and inflections of the voice, the personal appearance of the speaker, and like qualities, all of which appear to the senses and depend for their influence wholly upon the impressions thus made.

"Magnetic rubbers" effect their cures in two ways: by means of exciting the imagination of the patient, and by means of the vigorous rubbing to which they frequently subject their patients. It is particularly noticeable that this class of quacks never cure any organic dis-

ease. In many instances the maladies which they seem to expel as by magic are imaginary ills which do not really exist at all, except in the mind of the patient, or trivial functional disorders which are readily controlled by the mind when the patient is made to believe himself well. As a means of curing diseases through mental influence, the myth, "animal magnetism," is unrivaled, and as such it has done a great amount of good; but on the other hand the belief in this fallacy has done a vast deal of harm by diverting the minds of the credulous away from the true principles of hygiene and the healing art. Hence we believe that it ought to be thoroughly exposed and condemned. Whatever good there may be in appealing to the imagination as a means of cure can be utilized without resorting to any such quackery as is universally connected with the practice of "magnetic doctors."

Mind-Reading.—The recently developed phenomena of mind-reading, so called, have been taken by many as positive evidence of the existence of some hidden means by which one mind may communicate with another otherwise than through the medium of the senses. We have been much interested in the phenomena exhibited by persons professing to have this power, and have taken some pains to investigate them. We enjoyed the opportunity of being present, by invitation, at a meeting of scientists, clergymen, physicians, and lawyers, held for the purpose of testing the claims of the first mind-reader who appeared before the public, a few years since. The operation called mind-reading consisted in the operator's taking the hand of the person whose mind was to be read and pressing it firmly against his forehead, after having been securely blindfolded, and then leading him to some place in which the individual had previously secreted some object without the knowledge of the operator. In nearly every case this was done successfully, no matter how distant the spot nor how circuitous the route taken in secreting it. The operator claimed to put his mind in communication with that of the person with whom he was operating, and to learn by this means the location of the object. The result of the investigation was to show very clearly that the pretended mind-reader could not read the mind of any one but himself, and that he had no means of getting information except through the senses; but that he possessed an uncommonly fine sense of touch by which he could appreciate very slight, and to the individual operated with, involuntary, muscular movements. It was always necessary that the subject should keep his mind intently occupied with the object

during the whole experiment, otherwise it was never successful. This would naturally incline the individual to make the slightest resistance when moving in the direction of the object. This is undoubtedly the correct explanation of the mind-reading mystery. Dr. Geo. M.

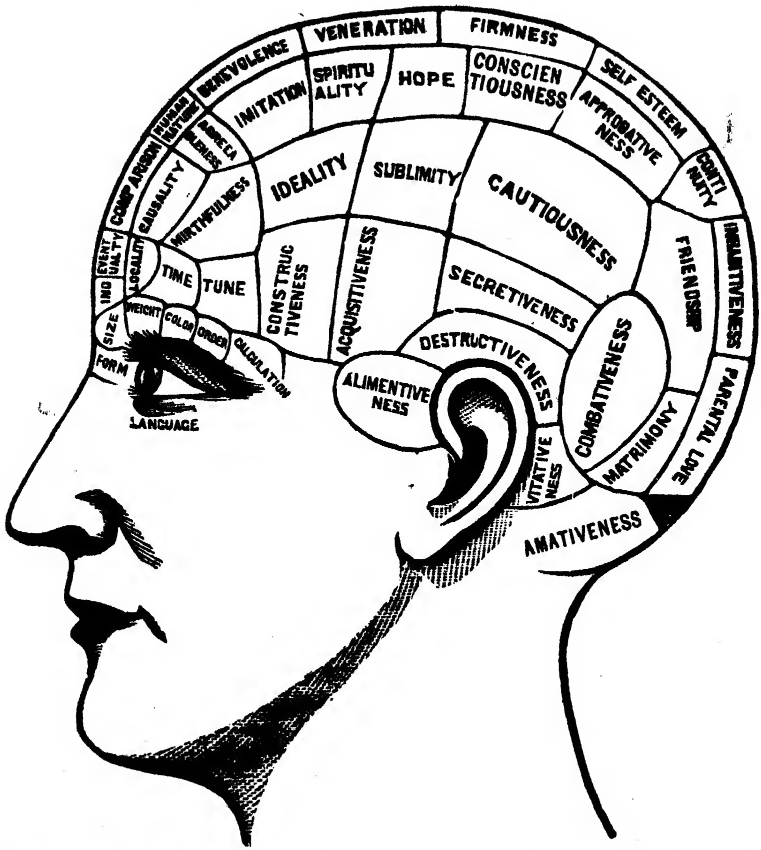


Fig. 76. A diagram showing the position of the various mental organs, or "bumps," as located by phrenology.

Beard, of New York, and other eminent scientists, have carefully investigated the same phenomena, and have arrived at essentially the conclusions stated.

Phrenology.—Probably no psychological theory originated in modern times has had so great an influence upon the minds of the civilized people of the globe as has the theory originated by Gall and Spurzheim, known as phrenology. Taken together with physiog-

nomy, this theory attempts to determine a man's character by the external configuration of his skull and face. With the exception of a very few points which may be considered as quite well established by physiological and pathological observations, the theory must be considered as strictly empirical in character. As such, it must be subject to great changes. Since it cannot be said to have an anatomical basis, as all settled theories relating to the brain and nervous system must have, phrenology is certainly liable to great and very considerable changes, as the structure and functions of the brain are more thoroughly worked out by scientific research.

While there is much that is good in phrenology as taught by its ablest exponents, it is capable of being made an agent for great injury; and we have sometimes questioned whether almost as much harm as good was not done by it as it is generally used. Attracted by its novelty, thousands have studied it sufficiently to get a very slight smattering of the names and locations of the "bumps," and then, supposing they possessed all the requisites to make them competent to delineate the characters of their fellows, point out deficiencies and merits, etc., they have set themselves up as phrenologists, head-examiners, bump-feelers,— blunderers would be a much more proper term to attach to them,—when in fact they hardly possessed intelligence and mother-wit enough to become first-class barbers. The amount of trash which has been retailed about the country, especially in the rural districts, under the name of phrenology, is appalling. The harm that these charlatans do is incalculable. They fumble the heads of those who visit them, assume a wonderfully wise look, and then proceed to deal out to them a character according as their fancy dictates, or as will the best serve their purpose. Even when a man has sufficient information and experience to enable him to form a nearly correct estimate of a person's character, he may still be utterly unqualified to give the proper advice to individuals respecting the best course to pursue to remedy their defects. The business of giving advice to people concerning the work of reforming depraved characters, or correcting natural deformities of mind, mental and moral, is certainly second to no other in which a human being could be engaged, and ought to be attempted only by one who is in the most eminent degree qualified for the work. The problems which come before a physician who deals with the sick and disordered body are the simplest possible compared with those which pre-

sent themselves for solution to those who profess to be the physicians of the mind. Bad advice given by such an individual may do an incalculable amount of harm, as we have had occasion to observe in more than one instance. We have known cases in which persons who had lived happily for some time in the relation of husband and wife have suddenly discovered that they were wholly uncongenial and incapable of being happy together after going to a phrenologist and being told that they were not adapted to each other. Not long since a young man rushed into our office in most precipitate haste, having hurried much as he knew we were about leaving to make a professional visit. He carried on his face a look of the most profound anxiety. There was evidently a real trouble on his mind. As we were about going out he begged us to stop just one moment. We inquired if he was sick. "Oh, no," he said, "but I must see you just one moment." "Is some one else suddenly taken ill?" we asked, really feeling some little alarm, as he appeared so solemn and anxious. "No one is sick," he replied, "but I want to see you a moment to find out what I am good for." We were puzzled, and asked for an explanation, which he promptly made by saying that he had just made a visit to a phrenologist, who informed him that he had made a mistake in choosing the life-work for which he was fitting himself, the gospel ministry, and that he should prepare himself for a physician instead. The young man was much agitated in reflecting that so much time had been lost, and wanted to begin at once in his proper sphere if he could do so. We quieted his fears when we learned the cause, advised him to pay no attention to the counsels of his unwise adviser, and to pursue the even tenor of his way as before. He was manifestly unfitted for the work of a physician, though he had a great love for books, delighted in the study of language, was highly conscientious, and very desirous of doing good to his fellow-men. His lack of power to adapt himself to circumstances, and especially his want of ingenuity either mechanical or otherwise, clearly indicated that almost any other calling would be better fitted to him than that suggested by his adviser, who charged him a half-dollar for counsel which would have made his life a failure had he followed it. Upon inquiry we learned that the self-styled phrenologist had condemned his plan to fit himself for the ministry on account of his not possessing the phrenological sign of large language, although in fact he had a most excellent memory of words, having already acquired good command of three modern lan-

guages. The work of such men is damaging to the world, and far more so than they themselves have any idea of its being.

We believe that phrenology in the hands of those who make it a specialty has been carried to an extreme; that claims are made by its advocates of powers which they do not and cannot possess. It is this, in fact, which has made the art,—it can hardly be called a science as yet,—obnoxious in the eyes of the great mass of scientists. Seeing that some claims are preposterous, they have neglected to investigate or give credit to any part of what is claimed. The many investigators who are now at work upon the cerebrum, examining its structure with the closest scrutiny of the microscope, and its functions by means of experiments upon living animals the nearest like man in their anatomical structure, will undoubtedly develop in time some facts bearing on this subject which will place what is true of the present phrenological doctrines upon a strictly scientific basis, and will add to them such elements as they lack of the completeness and definiteness which is required for a thoroughly symmetrical system of psychological science.

HYGIENE OF THE BRAIN AND NERVES.

As the brain and nerves are the controlling parts of the system, it is evident that upon the preservation of their health must depend in a very great measure the health of the whole body. A man whose brain and nerves are diseased cannot be healthy otherwise; neither is a person whose nervous system is in a healthy condition likely to be diseased otherwise. The marked increase in nervous affections of late years has become so noticeable that almost every medical writer calls attention to it, and this fact makes especially important the consideration of the laws which relate to the healthy action of this part of the body. The nervous structures are the most delicate of all the elements of the body; and when we consider the additional fact that they are subjected to more constant use than any other set of tissues, it certainly is not surprising that they should be specially subject to disease; but the great dependence of all other parts of the body upon the nerves makes it still more important that their integrity should be preserved.

Necessity for Mental Exercise.—Nerves as well as muscles require exercise to promote their growth and insure their development. That both brain and nerves are capable of development by exercise, and that development of these structures is largely dependent upon proper

exercise, are facts too well established to require proof by systematic evidence in this connection. Every-day experience convinces us of the fact. In the sharp contests of mind with mind in the battle for existence and the strife for fame, riches, and worldly honors, the mind which has been the most carefully trained to efficient action, which has by mental gymnastics learned to exercise to advantage its powers, always comes off victorious. It is not essential that the training should have been given in a school, or that the mental exercise should have been practiced in an academy or a college ; the farm, the workshop, the forest, or the coal-pit may have been the training-school or the gymnasium, but the work was done, and in such a manner as to secure a satisfactory result, and that is all that need be asked.

Mental exercise lies at the foundation of mental growth and mental health, and indirectly, we believe, it furnishes a firmer basis for muscular and general physical health than can be attained without it. The commonly received notion that mental work is harmful and incompatible with physical health we believe to be a gross and pernicious error. Our college students, male and female, who break down in health just as they have finished their studies, or before they have completed their course, are not victims to mental overwork, as a general thing. The same may be said of the great army of valetudinarian clergymen, lawyers, merchants, and others whose occupations are sedentary while involving considerable brain-work. In the great majority of instances, the failure of health in these cases is the result of flagrant violations of the commonest laws of health, such as deficient muscular exercise, bad food, late hours, fashionable dissipation, and, most of all, mental worry. The student hives himself up in his close study, probably smokes from three to a dozen cigars a day, lives upon the poorest boarding-house fare, and takes only just such little muscular exercise as he is compelled to do in going to and from his classes. Soon he finds his head dull, and he begins to worry because he is troubled to master his lessons. Now instead of gaining mental strength by his daily exercise, he is each day wearing out the vitality and wasting the very substance of his poorly nourished brain. Mental worry is corroding his intellectual powers, and he will sooner or later break down, a chronic invalid, and mental work will get the credit. In a similar way the clergyman, the lawyer, the politician, the merchant, breaks himself down. Thousands suffer with what is called "softening of the brain," when that organ is wholly intact except so far as it suffers through sympathy with other diseased organs, the whole trouble being in the stomach and liver.

This subject is so generally misunderstood that we deem it worth while to devote considerable space to it, and hence we will call attention to a few facts in support of these views, which we have for several years advocated in various ways, chiefly in lectures and through the journal of which we have had the editorial charge.

1. There is nothing in mental work which should make it especially liable to break down the constitution. On the other hand, it is well calculated to insure the highest degree of health. Since all the force manifested in the body originates in the nerve centers, chiefly in the brain, it is evident that the more vigorous the brain, the more vigorous the manifestations of force in the organs dependent upon it. And this is just the condition produced by mental labor. The brain grows in strength and vigor under exercise, and hence becomes capable of sending out more vigorous impulses to the various parts of the body dependent upon it for supplies of force.

Mental exercise is also agreeable to those who devote themselves to it. Authors, philosophers, poets, lawyers, enjoy their work, if successful in it; and only those who are successful, at least in a moderate degree, continue these pursuits. The same cannot be said of the mere mechanic or artisan who toils almost as mechanically as the machines which he employs. The poet loves his work and is loth to leave it. The hod-carrier gladly drops his hod and rejoices that his daily task is ended when the work bell announces the time at which he is allowed to stop. The muscle laborer seldom works unless necessity demands it; while the brain-worker keeps on toiling as arduously as ever long after the accumulation of a competency makes his labor wholly unnecessary. We speak now, of course, of pleasant mental pursuits which are not disturbed by mental worry. The harrowing anxiety of the stock-broker or the gambler is not conducive to health, mental or physical.

2. Brain-workers are long-lived. This statement will be almost certain to be disputed, and so we must fortify it with incontrovertible facts, which, fortunately, we are well able to do. Quite a little research has been made upon this question within the last few years, and with most decided results in favor of mental workers.

According to an eminent French writer, Gorgias the rhetorician lived to the age of one hundred and eight years, "without discontinuing his studies and without any infirmity." Epimenides, one of the seven "wise men," lived to the great age of one hundred and fifty-four. Hippocrates, the father of medical literature, who was a diligent student

and wrote voluminous works, many of which are still extant though penned more than twenty centuries ago, lived to the age of ninety-nine; and his master, Herodotus, attained the age of one hundred. Galen, one of the most celebrated physicians of antiquity, wrote three hundred volumes, many of which are consulted as authorities at the present day, and lived to be nearly a hundred years of age. Cornaro lived to the age of one hundred, though of a frail constitution, and did vigorous mental work for seven or eight hours a day until his death. The great Stoic, Zeno, a diligent student, lived to the great age of ninety-eight, when he put an end to his life while in the full possession of his faculties because he had received what he took to be an admonition that his time to die had come. Socrates was murdered at seventy-one in the prime of life. Pythagoras, Pindar, Quintilian, Chrysippus, and Thucydides lived to the age of eighty or upwards. Polybius and Plato died at eighty-one. Xenophon, Diogenes, and Carneades died at ninety. Euripides lived to the age of eighty-five. Anaxagoras died at seventy-two, and Aristotle at sixty-three. All of these men were hard-working students of nature and philosophy. They were the representative men of their times. They did work which has resisted the ravages of time and come down to us through the Dark Ages, in many respects work which cannot be surpassed in excellence, and often is unapproachable in its perfection. Yet all of them lived to almost double the present average length of life. Their average length of life is more than ninety-one years, which certainly does not militate against mental work as conducive to longevity.

Dr. Madden, in an able work on the "Infirmities of Genius" gives twelve tables of noted men of twenty names each, which sum up as follows:—

	AVERAGE AGE.
Twenty Natural Philosophers,	75
" Moral Philosophers,	70
" Sculptors and Painters,	70
" Authors on Law, etc.,	69
" Medical Authors,	68
" Authors on Religion,	67
" Writers on Language,	66
" Musical Composers,	64
" Miscellaneous Authors,	62
" Dramatists,	62
" Writers on Natural Religion,	62
" Poets,	57
Average of these Two Hundred and Forty Brain-Workers,	66

That the unusual longevity of the brain-workers already referred to was not due to the fact that they lived at an earlier age of the world is evidenced by the fact that the same characteristic is noticeable among mental workers of the present day, as is shown by the following table, which is made up of men who have lived in recent times :—

Bacon, Roger,	78	Young,	84
Buffon,	81	Ferguson,	92
Galileo,	78	Kant,	80
Copernicus,	70	Reid,	86
Lowenhoeck,	91	Goethe,	82
Newton,	84	Crebillon,	89
Whiston,	95	Goldoni,	85
Erasmus,	69	Watt, James,	83
Bentham,	85	Hobbes,	91
Mansfield,	88	Locke,	72
Le Sage,	80	Stewart, D.,	75
Wesley, John,	88	Voltaire,	84
Hoffman,	83	Cumberland,	80
Pinel,	84	Southern, Thomas,	86
Claude,	82	Coke, Lord,	85
Titian,	96	Wilmot,	83
Franklin,	85	Rabelais,	70
Halley,	86	Harvey,	81
Rollin,	80	Heberden,	92
Waller,	82	Michael Angelo,	96
Chalmers,	83	Handel,	75
South, Dr.,	83	Hayden,	77
Johnson, Dr.,	75	Ruysch,	93
Cherubini,	82	Winslow,	91
Herschel,	84	Morgagui,	89
Laplace,	77	Cardan,	76
Linnæus,	72	Fleury, Cardinal,	90
Metastasio,	84	Auguetel,	84
Milton,	66	Swift,	78
Bacon, Lord,	65	Watts, Dr.,	74

The average age of all the above-named persons, sixty in all, is a little more than eighty-two.

It is very evident that experience is decidedly against the commonly received notions on this subject. Though further evidence is scarcely needed, we may add the following from a recently published paper by Dr. Geo. M. Beard, of New York, well known as an eminent electrician and neurologist :—

"I have ascertained the longevity of five hundred of the greatest men in history. The list I prepared includes a large proportion of the most eminent names in all the departments of thought and activity.

"It would be difficult to find more than two or three hundred illustrious poets, philosophers, authors, scientists, lawyers, statesmen, generals, physicians, inventors, musicians, actors, orators, or philanthropists of world-wide and immortal fame, and whose lives are known in sufficient detail, that are not represented in this list. My list was prepared, not for the average longevity, but in order to determine at what time of life men do their best work. It was, therefore, prepared with absolute impartiality; and includes, of course, those who, like Byron, Raphael, Pascal, Mozart, Keats, etc., died comparatively young. Now the average age of those I have mentioned, I found to be 64.20.

"The average age at death at the present time, of all classes of those who live over twenty years, is *about fifty*. Therefore the greatest men of the world have lived longer, on the average, than men of ordinary ability in the different occupations, by fourteen years; six years longer than physicians and lawyers; nineteen or twenty years longer than mechanics and day-laborers; from two to three years longer than farmers; and a fraction of a year longer than clergymen, who are the longest-lived in our modern society."

Dr. Beard states among other conclusions at which he has arrived as the result of his investigations,—

"1. That the brain-working classes—clergymen, lawyers, physicians, merchants, scientists, and men of letters—live very much longer than the muscle-working class.

"2. That those who follow occupations that call both muscle and brain into exercise, are longer-lived than those who live in occupations that are purely manual.

"3. That the greatest and hardest brain-workers of history have lived longer on the average than brain-workers of ordinary ability and industry.

"4. That clergymen are longer-lived than any other great class of brain-workers."

Proper Mode of Developing the Minds of Children.—That there is a right way and a wrong way of dealing with young minds in order to develop them so as to fit them for their highest usefulness in after-years, is patent not only from the nature of things, but from the unsuccessful results to be seen in the illy developed minds of thousands

of men and women whom we daily see trying in vain to make their way well in the world against the numerous obstacles placed in their pathway, the most insurmountable of which are the results of bad training.

In a great many instances, perhaps in the greater share of cases, the process of education is a process of perversion from first to last. The child, when put to school at an age altogether too early, instead of being led along the path marked out by Nature for him to walk in, in his pursuit of knowledge, is set to work, or gone to work at, in a manner the most remotely removed from the natural order. Instead of beginning where Nature does, with the development and training of the perceptives, the sources of knowledge, thus teaching the learner at the outset how to observe thoroughly and accurately, in nine cases out of ten the teacher begins by giving the child instruction which can have no other influence than to lessen his reliance upon his own powers of observation and perception, and lead him to take such information as is dealt out to him unquestioningly, and without being able to see any natural relations between the knowledge imparted and that which it is supposed to represent. Thus his education continues, his mind being dwarfed by improper methods, and his body injured by unnecessary and harmful confinement, until the child either dies, becomes an educated dolt, or perchance, from natural brilliance of intellect, breaks away from the fetters forged around him and begins to think for himself at last, and then really begins to learn.

The majority of children do not enjoy school-life. It is irksome to them. It is actually repulsive, and naturally so. Learning is made hard work, when for them it ought to be made play. Children do not generally like work, but they do love play; and if instruction could be imparted to them through methods which would be to them play, a great gain would be made. The efforts of the managers of kindergartens in this direction are certainly commendable, and we hope they will be successfully introduced into every city and village in the land. We heartily concur in the following observations on this subject made by Dr. Richardson, one of the most eminent medical scientists of Europe:—

"For children under seven years of age the whole of the teaching that should be naturally conveyed should be through play, if the body is to be trained up healthily as the bearer of the mind. And it is wonderful what an amount of learning can by this method be at-

tained. Letters of languages can be taught; conversations in different languages can be carried on; forms of animal life can be classified; the surface of the earth can be made clear; history can be told as story; and a number of other and most useful truths can be instilled without ever forcing the child to touch a book or read a formal lesson."

School Cramming.—Nothing could be more unscientific nor more unphysiological than the popular methods of instruction in vogue in most of our schools for youth as well as in those for small children. The idea of education entertained by the average teacher is that it consists in infusing into the mind of the pupil the largest possible amount of knowledge which it can be made to contain. Little is thought of the necessity for thorough and systematic discipline of the mental faculties. Consequently, it is generally the case that the student's entire experience at school or college is one continual course of perversion. Instead of being taught how to think and study to the best advantage, how to investigate for himself, how to originate ideas and to become mentally independent, the student is continually discouraged by the methods employed by his instructors, from any attempt at originality or independence of thought, and thus becomes a dogmatic mental dwarf. We sincerely hope that the day will come when our educators will regard the primary object of schools as being for the culture and training of the human body, mentally, morally, and physically.

No system of education can be complete which does not give due prominence to the pupil's culture morally and physically, as well as mentally. The acquisition of knowledge should be regarded not as the primary object of education, but as a useful incidental result, necessitated by the nature of the discipline to be required.

Students should be thoroughly imbued with the idea that the object of their school work is not so much to impart to them a knowledge of facts, as to teach them how to acquire facts, how to investigate, how to compare, how to reason, how to utilize knowledge after it has been acquired. The methods of education generally followed in our colleges, fill young men with facts, and pack their craniums with the ideas of men who lived two thousand years ago, and then graduate them and send them out into the world destitute of even a modicum of practical knowledge, without the ability to use the facts which they have gained. Such men have much knowledge, but are unable to use it to practical advantage; and a score of them are of

less real use to the world than one practical man whose fund of information is almost infinitely smaller, but who possesses the faculty of utilizing knowledge. There is great need of reform in our educational institutions, and we are glad to see some evidences of improvement in this direction. The times call for practical men, and the public mind is being aroused to ascertain why there is so great a scarcity of men of this class. We hope the inquiry will continue, and that the agitation of the question which has begun, will increase until conservatism, prejudice, and dogmatism, which are the chief obstacles against educational reform, are swept away by the rising tide of public opinion in favor of progress in this direction.

Unsymmetrical Mental Development.—A marked tendency of the times is toward the selection of specialties, not only in the professions, but in all departments of life. This seems to be necessary on two accounts: 1. The accumulation of facts in the various departments of human knowledge is so great that a single mind cannot hope to grasp all. The best an individual can do is to become thoroughly conversant with one or two arts or sciences. Human life is not long enough, even if the capacity of the brain were sufficient, which there is reason to doubt, to master all that is known in the various subjects of study. 2. Some persons are born with a peculiar fitness for certain pursuits, mental or muscular, or both, and hence they will be most likely to succeed in those particular pursuits. This tendency, although it seems to be a natural outgrowth of the present state of society and of the world, and a necessary result of a high grade of culture, is nevertheless detrimental to the individual. While it benefits society as a whole, making it more perfect than it could otherwise be, the gain of society is at the expense of its individual members, or of some of them at least. By the undue development of certain faculties to the neglect of others, the sum total of brain force is weakened, and the brain becomes a monstrosity, and the mind a distortion. It is more than probable that this specialization of labor and of mental development is one of the causes which induce, at first eccentricity and afterward actual insanity, which is but one step removed from well-marked eccentricity. It is far better for each individual to acquire as equable a development as possible, mentally, physically, and morally; each one should endeavor to acquire as much as possible of this equable culture, as it will add force and endurance to the mind, even should

the individual afterward become a specialist in some branch of knowledge.

Evils of Excessive Brain-Labor.—While a proper amount of brain-labor is in the highest degree wholesome and conducive to longevity, as already shown, too much mental work is harmful in a high degree. The brain wears rapidly, and requires abundant time for rest and repair in sleep; when this is supplied, almost any amount of work may be performed which is possible to the individual. Brain-worry wears much faster than work, and to it should be attributed much that has been charged to brain-work. Physiologists have shown that three hours of severe mental labor exhaust the system as much as ten hours of severe physical labor, which leads to the conclusion that less time should be spent in mental labor than is usually spent in muscular labor between the intervals of rest. The student or professional man who goads his brain into activity when it is exhausted by want of sleep or long and severe labor, commits a crime against himself. The strongest mind will eventually break down under such usage. When the brain is weary and thought is laborious, rest is required, and it should be secured.

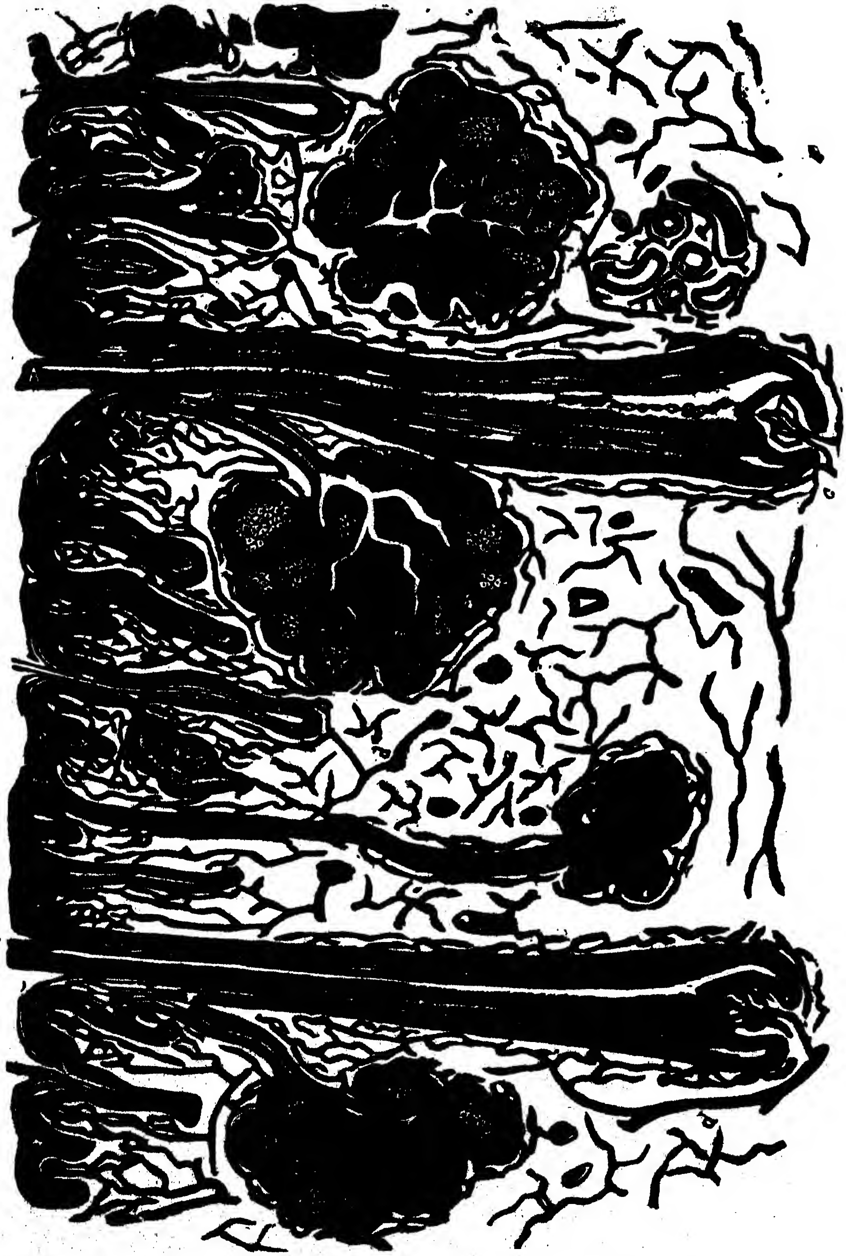
Pernicious Effects of Stimulants and Narcotics.—Brain-workers are of all classes the most strongly tempted to make use of excitants to enable them to obtain from their tired nerves a little more work than they are capable of doing with safety. Alcohol, tobacco, tea, coffee, and chocolate are all used for this purpose, and with apparent advantage in some cases, temporarily at least. But the advantage is only apparent. These drugs, and all others which operate in a kindred manner, are deceptive; they make a person believe he is not tired, when he is exhausted; they make him think he is warm, when he is really cold. They make him believe he is strong, when he is weak. Their use is most pernicious in its effects, since it more than doubles the danger from overwork. When in a natural condition, a man can tell by his feelings when he has gone to the full limit of his powers of endurance; but when his nerves are stupefied by alcohol or tobacco, or exhilarated with tea or coffee, he has no landmarks; he is at sea, and is certain to meet with disaster and shipwreck unless he change his course. This subject is more fully considered in a chapter devoted to the subject, to which the reader's attention is invited.

THE ORGANS OF SPECIAL SENSE.

In such low forms of life as the mussel and the earth-worm, what little sensation is present is of a very simple kind. As we rise higher in the scale of being, the general property of sensibility is modified to meet the wants of the higher order of existence, and special properties are developed. In man, in whom is found the highest type of sensibility, there are, in addition to the general sensibility which pervades the whole body, seven varieties of sensation, termed the special senses. Formerly there were enumerated but five, *hearing, seeing, smelling, tasting,* and *feeling;* but two others have been added within a few years, the *sense of temperature,* and the *muscular sense,* or the *sense of weight.* Each of the first five of these requires a special organ for its manifestation; to the study of these organs of the special senses and their functions we will now give our attention, considering the simpler organs first, and so gradually approaching the more complicated, which are undoubtedly the most wonderful exhibitions of delicate organization and perfect adaptation of means to ends in the body.

THE SKIN.

The skin contains the organs of touch, but cannot itself be called the organ of touch, as it performs several other functions, some of which are fully as important as this. The mucous membrane of the mouth and nose also possesses tactile sense. The skin is composed of two principal layers, which are easily separated, after death, by maceration in water. The inner of the two is the true skin, or *cutis vera,* in which are located all the organs and elements to which the functions of the skin are due. The basis of the structure of the skin is a dense network of elastic fibres, among which are closely interwoven minute blood-vessels, nerve filaments, and lymphatic or absorbent vessels. The skin also contains little pockets, or follicles, from which the hair grows, each hair from a single follicle. Closely connected with the hair follicles are small glands, the function of which is the production of fatty or sebaceous matter. Here are also found the perspiratory or sweat glands, which will be more accurately described elsewhere. Another interesting element of the true skin is involuntary muscular fibre, the contraction of which draws the skin into the peculiar condition known as goose-flesh.



Showing a Vertical Section of the Skin, greatly magnified. A. A. Hairs in their Follicles, connected with which are the Sebaceous Glands; *c.* Sweat Gland with its Duct; *d. d.* Blood-vessels.

PLATE IV.—*THE SKIN.*

The *cuticle*, or *epidermis*, is wholly made up of cells, which are produced by the true skin beneath. As the cells grow older they become shrunken and dead, and are gradually pushed out to the surface, becoming dried and falling off as new cells are pushed out beneath. These dead cells give to the epidermis a horny character, and when viewed with a microscope its outer layers are seen to be composed of delicate little scales, which are the dead cells referred to. The lower part of the epidermis contains colored cells, upon which the color of the skin in different persons and different races depends. In the negro these cells are abundant, giving to the skin a black color. In the lighter races they are less abundant, there being very few in the skin of the Caucasian, and none at all in the albino, whose transparent epidermis shows very clearly the red color of the living tissues beneath, with their abundant supply of blood-vessels.

The thickness of the cuticle varies in different parts of the body and in different persons. Its use is to protect the true skin beneath.

The nerves of touch terminate in the true skin, in a variety of ways. It is probable that in the majority of instances they end in the hair follicles already mentioned; but in the parts of the body in which the sense of touch is most acute, as the hands, a special arrangement to give the greatest possible delicacy is provided. This consists of what is known as tactile corpuscles, which are cone-shaped, corpuscular, resisting bodies located in the papillæ of the skin, as shown in the plate. The nerve fibres which convey tactile impressions terminate in these bodies, after coiling two or three times among them. The resistance which the corpuscles afford, adds greatly to the delicacy of the sense of touch. It is their presence in large numbers at the ends of the fingers which gives to this part of the skin such accuracy of touch. More than one hundred of these corpuscles were counted in a space near the end of a finger $\frac{1}{50}$ of an inch square, which would make more than 250,000 to the square inch.

The Sense of Touch.—Of the seven special senses this is undoubtedly the most simple; yet through it we learn many of the most important facts which we possess concerning external objects. We learn by it such properties of objects as size, form, and character of surface as to smoothness or roughness. The sense of touch greatly assists the other senses in acquiring correct ideas of the nature of bodies. We are rarely fully conscious of our real dependence upon this sense, or of the degree

to which it may be developed, until deprived of some of the other senses, especially sight. Numerous examples are given of persons who, upon losing their sight, have been enabled to develop their sense of touch to such a degree as to be really marvelous. Probably one reason for this remarkable increase in the delicacy and efficiency of touch is the concentration of the attention upon it when the sight is absent from birth, or has been destroyed.

The sense of touch differs greatly in delicacy in different parts of the body. The acuteness of the tactile sense in any part may be readily tested by observing the distance at which two pin points may be placed from each other without being recognized as two distinct objects. For example, two points applied in this way to the hand, will be recognized as two when but a slight distance apart; while upon the back they may be removed some considerable distance without being distinguished as more than one object. In this way the whole skin has been tested, the results showing that of all parts, the tip of the tongue is the most sensitive, recognizing points which are not more than one-twenty-fifth of an inch apart. The tips of the fingers rank next in sensibility, distinguishing objects which are no nearer to each other than one-seventeenth of an inch. From the tips of the fingers the acuteness of touch rapidly diminishes as we recede, being represented by a distance of one-seventh inch at the portion of the finger next the palm of the hand, one-third on the back of the fingers, three-fifths on the back of the hand, two-thirds on the skin of the throat, one and one-half inches on the sternum, and two inches at the middle of the back. The cheek is much more sensitive than the back of the hand, recognizing objects at one-third of an inch. Objects are recognized on the dorsum of the foot at a distance of one inch.

Fig. 77.

The sense of touch may be regarded as one of the most reliable of all the senses; yet we are liable to deception by it if impressions are received in a manner different from that in which they usually are. This fact is illustrated by an experiment the origin of which dates back to Aristotle. If two fingers be crossed as shown in Fig. 77, and a small

object placed between the ends, the impression will be that two objects are felt. The reason of this evidently is that by crossing the fingers the two sides of the fingers opposed are such as have been taught to distinguish separate objects, and they tell the same story which they have been educated to tell, notwithstanding it does not agree with the facts. This shows clearly that the action of the nerves as well as that of the brain is largely the result of education. An illustration of the same fact is to be found in a surgical operation sometimes performed for the restoration of a nose which has been destroyed by accident or disease. In this operation the skin of the forehead is brought down and made to grow into the form of a nose; but the sense of touch still retains the old position, so that when the new nose is touched, the impression is conveyed to the brain that the forehead has been touched. After a few months, however, the sense of touch is educated to recognize its new position, and the difficulty is overcome.

So with persons who have suffered amputation of a limb; they continue to feel the fingers or toes for some time. Persons have even claimed to feel actions which really occurred in amputated limbs. Such claims are, however, wholly based on the imagination. The phenomenon is due to the fact to which attention has just been called, that the nerves form the habit of carrying impressions from certain points, and whenever irritated in any way, carry the same impression even if they are no longer connected with the original points. The deception gradually fades away, the nerves by degrees becoming accustomed to their new condition, so that the amputated limb seems to grow gradually shorter and shorter until its real condition is correctly recognized by the nerves.

THE MUSCULAR SENSE.

The sense by which weight is appreciated, or the muscular sense, is supposed to be located in the muscles. It is evidently distinct from the sense of touch, because the tactile sense may be wholly obliterated by disease while the muscular sense remains.

It is this sense which enables a person to judge of the weight of an object, and to adjust his outlay of strength to the object to be lifted. If it were not for this sense our movements would be very irregular and spasmodic.

THE SENSE OF TEMPERATURE.

This sense bears a close relation to the tactile sense, but is also proven to be different because it often exists when the sense of touch has been lost by disease, and is sometimes lost while the tactile sense remains intact. By means of this sense we are able to determine degrees of temperature within certain limits. When an object which is very hot is brought in contact with the skin, the sensation is of pain, rather than of heat. It is a curious fact that the effect upon the nerves of sense as well as upon the tissues is essentially the same whether the object be very hot or very cold.

The thermal sense is not an accurate measure of heat, since, as with all other forms of sensibility, its impressions are relative rather than positive. This is well shown by a simple experiment. Place in three vessels a quantity of water of different temperatures, making that in the first vessel very cold, that in the third very hot, and that in the second intermediate between the two. Place one hand in the cold water and the other in the hot, holding them in the water one or two minutes. Then put first one hand and then the other into the middle vessel of water at the medium temperature. The curious fact will be observed that each hand tells a different story about the temperature of the water in this vessel. The one which has been in the hot water says it is cold, while the other hand, which was removed from the vessel of cold water, declares that it is warm. From this experiment it is clear that our ideas of temperature gained through the thermal sense are only relative.

It is also worthy of notice that the apparent temperature of objects depends in a great measure upon their character. An object which is a good conductor of heat seems to possess a much higher temperature than one which is a poor conductor, although the absolute temperature of both may be exactly the same. It is this fact which causes metals and liquids to seem warmer at a given temperature than gases and solid objects composed of such poor conductors as wood, straw, hair, and similar substances. Liquids of a higher temperature than 120° can be borne but for an instant, while vapor of 140° or 150° can be endured without pain, and the whole body may be immersed in hot air at a temperature of 250° and upward with impunity. We have remained some minutes in a room of this temperature without the slightest injury; and persons have been known to endure a very much higher temperature in perfectly dry air.

THE SENSE OF TASTE.

The sense of taste, or gustatory sense, is located in the mucous membrane of the tongue, being attributable to two nerves, one of which is distributed in the anterior portion of the organ, and the other in the mucous membrane of the back part of the tongue and mouth. The terminal filaments of these nerves seem to end in little prominences with which the membrane is closely studded, which are known as *papillæ.* The larger of these are supposed to be devoted to the sense of taste, while the smaller contain nerves of touch and of the thermal sense, both of which forms of sensibility are possessed by the tongue in a high degree, especially by its tip, which possesses the most delicate tactile sense of any part of the body. This portion is not quite so sensitive to taste as the posterior portion of the organ.

The sense of taste, like the senses of touch, weight, and temperature, is exercised only upon bodies which come in immediate contact with it. In the case of taste, however, mere mechanical contact is not sufficient. An object to be appreciated by the gustatory sense must be dissolved, so that it may come in direct contact with the nerves of taste by penetrating the papillæ in which they terminate; hence, any substances placed upon the tongue when dry, will not be tasted until dissolved, if at all; and insoluble substances evidently can possess no gustatory properties. When the tongue becomes "coated" or "furred," as it often does in sickness, the sense of taste is greatly lessened in acuteness, which accounts in a great degree for the insipidness of foods and drinks so often complained of at those times.

Physiological experiments seem to show that the sense of taste is confined to the tip, edges, and back portion of the tongue, and the back portion of the roof of the mouth and the soft palate, being absent from the lips, gums, middle of dorsum or back of tongue and its under side, and from the front part of the roof of the mouth.

Tastes are classified as acid, saline, bitter, and sweet, though it is evident that there are many flavors which are not included in this classification, and which cannot be accurately described. Of these different tastes it is curiously observed that those of a saline and bitter character are best appreciated by the back portion of the tongue, and sweet and acid flavors by the anterior portion. Some physiologists claim that acids are best appreciated by the sides of the tongue. All of these various tastes seem to be increased by friction of the

tongue against the roof and sides of the mouth, which is probably due to the diffusion of the sapid substance.

Taste Aided by other Senses.—Many of the properties of substances appreciated in the mouth prove, upon careful examination, to be recognized by other senses than that of taste, although credit is given to the latter. For instance, people often speak of astringent, oily, mealy, watery, smooth, burning or pungent, and cool tastes, when in reality these are not tastes at all, but are properties recognized by the senses of touch and temperature. So, also, substances are spoken of as having strong tastes when they have very little taste indeed, but are simply smelled when in the mouth. Sight is also an aid to the sense of taste by exciting agreeable anticipations.

The Uses of Taste.—Besides being a source of gratification, the sense of taste is useful as a guide in the selection of food. As a general rule, substances which are unpalatable, repugnant to the taste, are unwholesome. There are, it is true, cases of individual idiosyncrasy in which the sense of taste rejects articles which are really wholesome; but even in these cases the taste may many times be a correct guide, as the digestive organs are in close sympathy with the gustatory sense, and might resent the usually wholesome aliment on account of the same unexplainable peculiarity.

The taste is susceptible of education in a very high degree. Even the most repugnant substances may by degrees be made acceptable. Tastes vary greatly in different countries, one nation considering as a delicacy what would be most loathsome to others. For instance, nothing could be more repulsive to the palate of a Frenchman than the putrid flesh considered as a delicacy by some nations; and it is quite likely that the latter would consider equally disgusting the asafetida which the former sometimes employs as a flavor in his dainty dishes.

Electrical Excitement of the Sense of Taste.—The sense of taste may be excited by a current of electricity as well as by sapid substances. A very simple experiment will illustrate this fact. Place upon the upper side of the tongue a piece of brightly polished zinc, and upon the under side a large copper penny or a silver half-dollar, bringing the edges of the two metals together at the tip of the tongue. In a few seconds a very strong metallic taste will be experienced. If the positive pole of a battery be touched to the tongue, while the other is held in the hand, an alkaline taste will be experienced; and the application of the negative pole will produce a strongly acid taste. We

have frequently observed in practice that excitation of the nerve of taste is often felt by patients during the application of galvanism to other parts of the body.

THE ORGANS OF SMELL.

The organ of smell, or the olfactory sense, is located in the upper part of the nasal cavity, the mucous membrane of which part receives the branches of the olfactory nerve which are sent down from the olfactory bulbs—a portion of the brain located just above—through a large number of very small openings in the floor of the skull, provided for this purpose. The balance of the mucous membrane of the nose is supplied with branches from the general sensory nerve of the face, and has nothing to do with the sense of smell. The ends of the olfactory nerves are not imbedded in the mucous membrane as are the nerves of taste and the sensory nerves, but are exposed with a very slight covering of epithelium, so that they may receive more delicate impressions. Smell is produced by the actual contact of odorous particles with the nerve filaments. It seems also to be necessary that these particles should be brought to the nose suspended in the air; since the nasal cavity may be filled with rose-water, the odor of which is very marked, without exciting the sense of smell in the slightest degree. Although a certain degree of moisture is necessarily maintained, the presence of a large amount of fluid interferes with the function of smell altogether. In ordinary breathing, the air taken in through the nose passes only through its lower passages, and does not come in direct or immediate contact with the nerves of smell in the upper portion of the cavity; but odorous particles in the air reach the nerves of smell by diffusion of the air upward. By the act of sniffing, however, which is instinctively performed when we wish to intensify the sense of smell, the air is forcibly drawn up into the upper part of the nasal cavity, and thus brings a larger number of particles in contact with the olfactory nerve than in ordinary respiration.

We are able, by means of the olfactory sense, to appreciate a very great variety of odors, the number of which is so great as to make almost utterly impossible any attempt to classify them. These odors can not only be distinguished when presented separately, but also when mingled they can be recognized individually. The quantity of material necessary to excite the sense of smell is exceedingly minute. A single grain of musk will fill a room with its odor for many years without appreciably diminishing in weight.

It is a curious fact that mental impressions and associations are more closely connected with smell than with any other sense. Many persons are so susceptible in this regard that a very slight excitation of the sense with certain odors will cause them to faint.

Uses of the Sense of Smell.—In addition to affording a great amount of pleasure by enabling us to recognize the numerous delicate and pleasing perfumes which abound in nature, especially in the botanical world, the sense of smell apprizes us of unwholesome constituents in the air, and of our proximity to sources of injury to health. The olfactory sense thus protects not only the lungs and other respiratory organs, by enabling us to avoid irritating gases which might cause serious injury to the whole system, but it is also useful to enable us to judge of the properties of food, and to stimulate the appetite and the action of the organs of digestion. It is not true that all harmful substances possess bad odors, but it is almost universally true that substances possessing an unpleasant odor are not wholesome. The sense of smell is a valuable sentinel to the citadel of life, and ought to be carefully guarded and protected. It may be educated to a great degree of delicacy.

As a general rule the lower orders of animals possess this sense in a much more acute degree than man. Wild animals will scent their prey or their enemies at a great distance. The keenness of scent in the dog is marvelous. This doubtless depends largely upon the fact that in animals of this class the olfactory nerve is spread over a much larger space than in man. In barbarous tribes the sense seems to be much more highly developed than in civilized man. Humboldt, the great naturalist and traveler, states that the natives of Peru can distinguish in the dark between different races by this sense.

HEARING: THE AUDITORY SENSE.

The organ of hearing consists of three parts: 1. The *external ear,* a trumpet-shaped portion for collecting sounds; 2. The *middle ear,* or *tympanum,* a cavity separated from the external ear by a membrane resembling a drum-head in its character and use, and containing several delicate bones, or *ossicles,* which play an important part in the action of the ear; 3. The *internal ear,* or *labyrinth,* which contains the terminal filaments of the auditory nerve and delicate apparatus connected with the reception of auditory impressions of various kinds.

The External Ear.—The external portion of the ear consists of a framework of cartilage covered with skin, having a shape somewhat like that of a conch-shell. It is attached to the bones of the head in such a manner as to be easily movable within small limits. In lower animals the various movements admissible are produced by a special set of muscles for the purpose. In man these muscles are usually so slightly developed that they are capable of producing no perceptible motion, only in very exceptional instances.

Fig. 78. The Ear. The cut shows the External Auditory Canal, the Middle Ear with the Ossicles, and the Internal Ear.

The outer portion of the ear is connected with the middle ear by means of a slightly curved canal about one and one-fourth inches in length, across the bottom of which is stretched the outer boundary of the middle ear. This canal is lined by a continuation of the skin of the ear, which here becomes very thin and sensitive, and contains glands that resemble the sweat glands found in other parts of the skin, but which here secrete a waxy substance called *cerumen*, of an intensely bitter taste, the probable object of which is to guard the ear against the entrance of insects. Numerous fine hairs here found doubtless assist in protecting the ear from insects, dust, and other foreign bodies. The ear-wax is usually produced in small quantity, and dries and falls from the ear in thin scales.

The Middle Ear.—The middle ear, or *tympanum*, is a cavity placed between the external and internal ears. Its structure is such as to remind one of a drum. The cavity consists of a little hollow in the temporal bone of the head, the outer side of which is bounded by a membrane which separates it from the outer ear, and is known as the *membrana tympani*. Its inner side also presents an opening which is covered in a somewhat similar manner. The tympanum is not a closed cavity, as it communicates with the throat or back part of the nasal cavity by means of a small canal known as the *Eustachian tube*.

The Ear-Bones.—The middle ear contains in its cavity a chain of bones, three in number, reaching across from one side to the other. These delicate bony structures have received names corresponding to their different shapes. The first being shaped like a mallet, is called the *malleus;* the second, from its resemblance to a blacksmith's an-

Fig. 79. Bones of the Ear. *a.* Malleus; *b.* Incus; *c.* Stapes.

vil, is known as the *incus,* which has that signification; and the third, from its resemblance to a stirrup, is called the *stapes.* The first of these bones is attached by its longer part, or handle, to the drum membrane. All the bones are connected by delicate joints, and the innermost bone, the *stapes,* fits into an opening in the opposite wall of the middle ear by which it is connected with the internal ear.

Connected with the ear-bones and the drum membrane are three delicate muscles, the smallest in the body, which by their action regulate the movements of these parts. Two of these are attached to the drum membrane, their use being to relax it and to render it tense, and the other to the *stapes.*

The Internal Ear.—This is one of the most delicate and complicated mechanisms in the body. Owing to its complex structure and tortuous canals, it is called the *labyrinth.* This is the most essential part of the auditory apparatus. It is placed in a hollow in the densest part of the temporal bone. It may be divided into three parts: 1. The *vestibule,* or ante-chamber; 2. The *cochlea,* or snail-shell; 3. The *semi-circular canals.*

The vestibule, semi-circular canals, and cochlea are all filled with a limpid fluid. Suspended in this fluid by means of delicate bands of fibrous tissue placed like braces on all sides, is a membranous sac also filled with fluid, which corresponds in shape exactly to the form of the vestibule, canals, and cochlea. In the walls of this sac are found the terminations of the auditory nerve.

The inner surface of the membranous sac presents a most wonder-

ful structure. Lining the sac in places are cells of various shapes, some of which bear upon their outer surface a number of minute, but sharp, stiff hairs. These cells are connected with the fibres of the auditory nerve, and it is supposed that the fine hairs described are really the extreme ends of the nerve filaments, which are thus bathed in the limpid fluid which fills the whole internal ear. Within the sac are also to be found curious little chalky particles called *otoliths*, or ear-sand.

Fig. 80. The Internal Ear.

Physiology of the Ear.—Having briefly described the structure of the ear, we will now proceed to give a concise account of its functions. The chief duty of this organ is to receive impressions of sound, and to note the differences between various sounds in force, pitch, and quality. In order to comprehend how this is done we must understand something of the nature of sound.

The Nature of Sound.—If a stone be dropped into the water, a series of circular waves extend out from the point at which the stone entered the water. These waves are caused by vibration of the water, which is produced by the motion communicated to it by the stone. In a similar manner, moving bodies communicate motion to the air. A fan, gently moved by the hand, produces waves in the air which may be felt, though not heard. The wings of a humming-bird or an insect fan the air so rapidly that waves are produced which can be recognized by the ear. This is what is termed sound. The range of sounds which can be appreciated by the human ear is very great, the lowest being produced by sixteen vibrations per second, and the highest by about forty-eight thousand vibrations per second, equivalent to a range of about eleven and one-half octaves. Persons differ in their capacity for appreciating sounds, some being able to hear lower sounds than others, and *vice versa*. It is also probable that lower animals differ from one another and from man in this respect. There is at least good reason for believing that some insects

are capable of making sounds which are produced by vibrations too rapid to be appreciated by the human ear, though they may be heard by the insects themselves. Some years ago an eminent European scientist devised an experiment by which he was able to demonstrate not only that vibrations of air much more rapid than can be detected by the human ear can be produced, but that these extremely acute vibrations possess the same qualities as those less rapid, except that they cannot be perceived by the ear.

Sounds are generally divided into musical sounds and noises, although this is a purely arbitrary division, as in reality no exact line can be drawn between these two classes of sounds. It is generally understood, however, that a musical sound is one that is produced by regular vibrations, or those which are repeated at regular intervals, while noises consist of irregular and discordant vibrations occurring at irregular intervals.

The question sometimes discussed with so much display of argument on both sides, whether there would be sound if there were no ears, we need hardly notice here; it will be at least sufficient to say that the settlement of the question wholly depends upon whether it is viewed from the standpoint of the physiologist or that of the physicist. The physiologist regards sound as the sensation produced upon the ear by certain vibrations of air; the physicist studies as sound the air-waves which produce the sensation upon the auditory nerve.

How We Hear. — The operation of hearing is a very interesting one, and becomes quite simple when the structure of the hearing apparatus is well understood, since there is provided for each necessary part of the operation an organ or series of organs well adapted to accomplish the work. When the air is set in motion by a rapidly vibrating body, the sound-waves are collected by the external ear and concentrated in the short canal, at the inner end of which the drum membrane is placed. The motion of the air is communicated to the drum membrane, and by its movement the ear bones are caused to oscillate, and thus transmit the vibration to the fluid which fills the internal ear. The vibration readily extends from the fluid in the vestibule and its communicating cavities to the membranous sac which it contains, and to the limpid fluid contained in the sac. The motion of this fluid causes vibration of the delicate hairs which project into it, and which, as we have seen, are undoubtedly the ends of

the filaments of the nerve of hearing. Thus the external air-waves have been conducted to the auditory nerve, by which the impression is carried to the auditory center at the base of the brain, which in turn transmits it to the cerebrum, the seat of the intellect, and then the sound is recognized.

The Musical Instrument of the Ear.—From the peculiar structure of the cochlea it is believed that this part of the internal ear is devoted to the recognition of musical sounds, and especially to the pitch of sounds. There is in its structure so close a resemblance to the strings of a piano and the accessory apparatus that physiologists who have studied this part have universally remarked the analogy. There is even a damping arrangement, or what seems to be such, for the purpose of preventing the confusion of sounds when they are received in rapid succession. It was formerly supposed that the otoliths had something to do with the production of sound, but it is now conceded that their action, if they have any, is not known.

The Accommodation of Hearing.—Experiments concerning the action of stretched membranes with reference to sounds of various pitch have shown that the tension of the membrane must be varied for differences in pitch in order that they may be heard the best. For the safety of the ear it is also important that there should be some means of relaxing the membrane and the accessory organs so that injury shall not be received from very loud sounds. These needs are supplied by the delicate muscles of the drumhead and the *stapes.*

Use of the Eustachian Tube.—The object of this canal is to equalize the atmospheric pressure in the drum or middle ear with that outside. The pressure of the atmosphere is constantly changing, as is indicated by the changes in the barometer; hence, if no provision of this sort were made, the drum membrane would sometimes be pressed outward, and sometimes inward, which would greatly interfere with its function. This is well seen when the tube becomes closed up in consequence of a cold, which not infrequently happens; at such times the hearing is greatly obstructed. The Eustachian tube also comes into use when persons ascend to great heights by going up in a balloon or climbing mountains; also, in the cases of persons who work under water by means of diving-bells. The walls of the tube usually lie in contact, so when changes in the internal and external pressure are made rapidly, it sometimes becomes necessary to

assist nature in changing the volume of air in the ears. This is readily done by a very simple means which any one can employ. After taking a deep breath close the lips tightly, and close the nostrils with the fingers by pressing them firmly together; then attempt to expel the air through the nose, as in blowing the nose, but still keep it tightly closed. By this maneuver the Eustachian tube will be opened and air forced into the drum. This procedure is found to be a very important one with divers who descend to their work under an immense bell. The weight of the water causes a very great increase in the pressure of the air in the bell upon the drum membrane. When persons so engaged neglect to observe this precaution, the membrane is not infrequently ruptured.

Source of the Power of Maintaining Equilibrium.—Careful examination of the walls of the semi-circular canals of the internal ear have shown that they do not contain fibres from the auditory nerve, and hence do not take an active part in the process of hearing. For some time it was a source of great perplexity to decide the function of these curious structures. At last an ingenious physiologist instituted a series of experiments on these organs in birds; and he found that their function is to aid in maintaining an equilibrium, by giving information respecting changes in position of the head. The manner in which this is done is very remarkable and interesting, but the process is too complicated for explanation here. It may be remarked, however, that the function is based upon the well-known fact that fluids contained in vessels have a strong tendency to retain their actual position instead of changing with every movement of the containing vessel. For instance, a glass containing water may be turned around without turning the water. The semi-circular canals contain a limpid fluid closely resembling water, and the three canals are so placed with reference to each other that the effect of any change of position may be noted by the change in the walls of the canals with reference to the fluid contained within them. This fact may explain the dizziness which often accompanies disease of the ear, the explanation being that in these cases the part of the ear is affected, the duty of which is to apprise the brain of the muscular actions necessary to maintain the equilibrium of the body.

How Direction of Sounds is Determined.—The direction of sounds is probably determined by changing the position of the head and observing the direction in which the sound is most distinctly

heard. Most lower animals can accomplish the same end in a large degree by changing the position of the ear by means of the muscles which they possess for that purpose, but which in man are not sufficiently developed to be of use.

Our power to determine the direction of sounds is quite limited, as also is the power to determine the distance from which sounds come which fall upon the ear. That is, it is very difficult, often impossible, to distinguish between a feeble sound and one which comes from a distance.

Interesting Facts about the Sense of Hearing.—Like most of the other senses, the ear refers its impression to the outside. It is a curious fact, however, that if the external ear be filled with water, this is no longer the case; sounds then seem to originate and to be located within the head.

The ear exceeds all the other senses in acuteness of perception. If impressions are made upon the eye in so rapid succession as ten in a second, they become fused; that is, they run together and become indistinguishable. In the case of the ear, however, sounds which follow one another with the rapidity of one hundred a second, as in the ticking of a fast-beating pendulum, are heard as distinct sounds.

It is a common observation that some people have not "a musical ear." This is owing to the fact that they cannot readily distinguish one tone from another. Ears which are well trained can distinguish between notes which differ less than the one-hundreth part of a tone. Notes higher than 4000 vibrations per second are, however, distinguished with great difficulty.

It is a commonly known fact that the ticking of a watch may be heard much more distinctly when held between the teeth than when at the same distance from the ear and not in contact with the teeth. Instruments for the relief of deafness are in use, which are based on this principle, known as the *audiphone* and the *dentaphone*. By the aid of these instruments the sound-waves are conducted to the internal ear through the bones of the head.

THE EYE AND ITS FUNCTIONS.

The organ of vision consists essentially of two parts, the optical instrument itself, or the eyeball, and the accessory organs and enveloping parts. The latter, which we will describe first, consist of the *orbit*, the *eyelids*, and the *lachrymal* or *tear apparatus*.

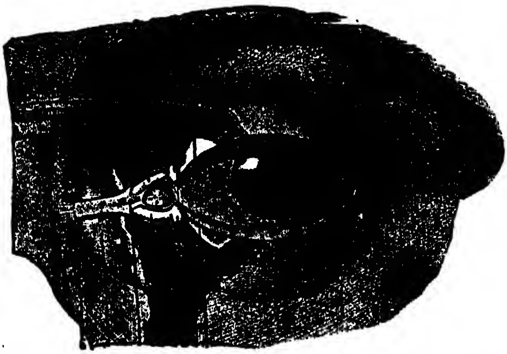


Fig. 81. The Eye, showing at its inner border the apparatus for removing the tears from the eye.

The Orbit.—In order to protect it from mechanical injury, the eye is placed in a deep socket formed by the bones of the cranium and face. The edges of the socket project so much beyond the eyeball that it will readily escape injury, even should a blow be received upon that part of the face, unless from a small instrument aimed directly at the eye. The overhanging brow is covered with short hairs so arranged as to conduct away the perspiration when a person is sweating freely, and prevent its entering the eye. An opening in the bottom of this bony socket gives entrance to the nerve of sight, which passes into the eyeball. In the back part of the orbit is to be found a large amount of fatty tissue, which forms a sort of cushion for the eyeball, to protect it from any injury from jar.

The Eyelids.—The eye is protected in front by two movable curtains, the eyelids, the upper of which is the larger and moves very freely, the lower being short and having little motion. The lids are composed chiefly of skin, lined with a delicate mucous membrane known as the *conjunctiva*. The edges of the lids present a row of fine hairs, the eyelashes, which protect the eye from dust, and when the lids are partially closed, diminish the amount of light that may enter the eye. Just within the row of eyelashes may be seen a line of delicate points which are the mouths of ducts leading from minute sebaceous glands which secrete an oily substance and pour it out upon the edges of the lids, by means of which they are prevented from ad-

hering together during sleep. By the same means the lachrymal fluid which lubricates the eye is prevented from overflowing upon the cheek.

Fig. 82. The Glandular Apparatus of the Eye; 7. Lachrymal gland; 8, 9, 10. Ducts; 11. Openings of ducts; on inner border of upper lid; 6. Glands for lubricating edges of eyelids.

The Lachrymal Apparatus.—Just within the outer and upper border of the orbit is placed a little gland, the function of which is to secrete a limpid, lubricating fluid, the *lachrymal fluid*, or tears, from which fact it is called the lachrymal gland. The fluid formed flows down and across the eye, moistening its whole anterior surface, and is drained off at the lower and internal angle of the eye by the *nasal duct*, a canal which leads to the nose. This fluid protects the eye both by washing away impurities and by keeping it transparent. When the cornea, or transparent part of the eye, becomes dry, it loses its lustre and becomes partially opaque. This is well seen in fishes when they have been removed from the water for some time. They have no lachrymal apparatus, since their natural element, the water in which they swim, answers the same purpose.

In the edge of each lid, at the inner end, are little openings through which the tears are drained off into the nasal duct and so conveyed to the nose. These can be seen in the lower lids by drawing them downward and forward.

The secretion of the lachrymal fluid is constant, but only in sufficient quantity for the purpose of lubricating the eye, except when the mind is laboring under the influence of some strong emotion, when it is poured out in such quantities that it escapes over the lids upon the cheek in tears. Irritating substances in the eye, a harsh, dry wind, and irritating vapors, produce the same effect.

The Eyeball.—The ball of the eye, which is the essential instrument of sight, in many respects resembles the camera of the photographer, as will be seen from the description. The eye-ball is not perfectly spherical in shape, though approaching the form of a globe. Its average diameter is about an inch. It is composed, essentially, of three investing membranes or coats, called *tunics*, and three transparent media inclosed, called *humors*.

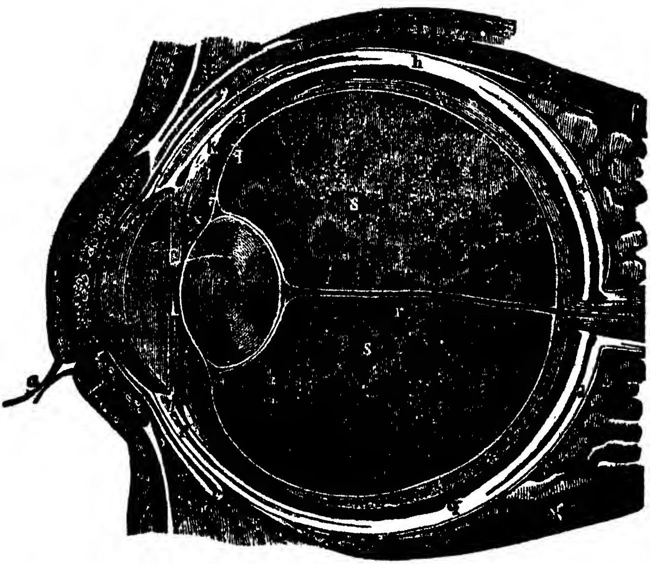


Fig. 83. Vertical Section of the Eyeball. *a.* Eyelashes; *a.* Eyelids; *i.* Cornea; *V.* Aqueous Humor; *l.* Crystalline Lens; *s.* Vitreous Humor; *m.* Iris; *o.* Retina.

The outermost tunic is called the *sclerotic*. It is a tough, fibrous coat, and forms what is known as the white of the eye. It covers the whole eyeball with the exception of a small circular portion which is covered by a peculiar, horn-like, transparent structure which is a continuation of the sclerotic, and is called the *cornea*. It is this which forms the lustrous portion of the eye, through which its color is seen. The cornea acts as a window to the interior of the eye.

Within the sclerotic is another tunic, the *choroid*, which is a delicate membrane filled with blood-vessels to nourish the eye, and lined upon the inside with a layer of dark, nearly black, coloring matter. The choroid is also absent in front, ending at the margin of the cornea; but it is continued by a circular curtain called—

The Iris.—This delicate structure is what gives to the eye its color. Its outer side is in different persons a great variety of colors, being brown, blue, gray, hazel, and many other shades. Its center is pierced by an opening called the pupil. Its back side is covered, like the choroid, with a layer of black pigment, the object of which is the same as that had in view by the manufacturer of telescopes and microscopes when he covers with a coat of black paint the inside of his instruments, viz., the absorption of wandering rays of light, and the prevention of reflection in the eye, which would occasion confusion of vision. In albinos these dark cells are wanting, in consequence of which they suffer from imperfect vision. The same is true of albinos among lower animals, as white elephants, white rabbits, etc. In blue and gray eyes the pigment cells are less abundant than in black and brown, being found only on the back side of the iris, while in black and brown eyes pigment cells are found upon both sides and in its substance. Dark eyes are usually associated with dark features on account of the generally greater abundance of pigment throughout the body.

A careful examination of the iris with the microscope shows that it is made of two sets of fibres, one of which radiates from the center toward the circumference, while the other is arranged circularly. The circular fibres, by contracting, make the opening through the iris smaller, while the radiating fibres, by contracting, make it larger. Thus the size of the pupil is regulated according to the amount of light which is needed in the eye for the purposes of vision, or which may be tolerated without injury to its delicate structures. The action of the iris of the cat can be very easily seen. When exposed to a bright light, the pupil becomes very small; but when taken into a room where there is little light, it becomes greatly dilated. It is in part the great power of dilatation of the pupil which enables the cat and the owl to see well where the light is insufficient for most other animals and human beings. When we enter a darkened room, we cannot see distinctly for some minutes, as is also the case when we are suddenly brought into the presence of a bright light. This is owing to the fact that time is required for the iris to accommodate the size of the pupil to the amount of light furnished. When the variation in the intensity of the light is but slight, as is ordinarily the case, no perceptible time is required; but a longer period is necessary when the difference is great. Every person has experienced temporary inability to see objects distinctly after looking at the sun for a few seconds steadily.

Certain drugs possess the power to cause dilatation of the pupil by paralyzing its muscular fibres. Belladonna, one of the chief of these, derives its name, which signifies beautiful lady, from the fact that it has been much used to cause dilatation of the pupil to add brilliance to the eyes. Death has not infrequently been occasioned in this way.

The Ciliary Muscle.—Between the sclerotic and the choroid, around the edge of the cornea, is another curious little muscle, known as the *ciliary* muscle, the use of which will be seen presently.

The Retina.—This constitutes the third and inner coat of the eye. It is made up almost wholly of the end filaments of the optic nerve, which enters the ball of the eye at the back side and spreads out into a thin membrane to form the retina. It contains many delicate and curious structures connected with vision, but too complicated for explanation in a popular treatise like this. The retina is sensitive to no impressions but those produced by light. That is, if otherwise stimulated, it produces only the sensation of light.

The Crystalline Lens.—This is the middle one of the three transparent media of the eye. It is placed in the eye just behind the iris, so that the center of the pupil is just opposite its center. Its shape, as will be seen by reference to Fig. 83, is like that of a convex lens or burning-glass. It is of quite firm consistency, feeling to the touch almost as hard as cartilage. It is held in place by means of a delicate sac or capsule which incloses it, and is attached by its circumference to the choroid coat just behind the iris. Its thickness is about one-fourth of an inch. The lens possesses great transparency in health, but sometimes, especially in old age, it becomes opaque, occasioning the disease known as cataract. Attached to the choroid behind the border of the capsule of the lens is the ciliary muscle previously described.

The Aqueous Humor.—This is a watery fluid contained in the small space between the lens and the cornea in front. The free inner edge of the iris floats in the aqueous humor. It is this limpid fluid which escapes when the eye is punctured by a sharp instrument.

The Vitreous Humor.—Behind the crystalline lens, and filling the greater part of the eyeball, is the vitreous humor, so called on account of its imagined resemblance to melted glass. This structure is also very transparent. It constitutes about two-thirds of the eyeball. The retina, the inner tunic of the eye, lies in close contact with it.

The Physiology of the Eye.—In order to understand the manner in which the mechanism of the eye operates in producing vision, we must

first learn something of the nature of light, that with which the eye has to deal. The generally accepted theory of light is what is known as the undulatory theory, which supposes that all space is filled with a subtile medium known as ether, and that light is simply the waves, or vibrations, or undulations, of this ether, just as sound is the result of the vibrations of air. These vibrations are caused by luminous bodies, as the sun and stars, and by all substances undergoing combustion.

Properties of Light.—Objects which allow waves of light to pass through them are called transparent or translucent, according to the readiness with which they allow the passage of light. No substance known is perfectly transparent. Even the atmosphere and the purest water are opaque in some degree.

Light-waves travel in straight lines, radiating from their source. Those which come from a great distance vary so little in direction that they are considered as parallel.

Properties of Lenses.—Fig. 84 illustrates the property of a lens to change the direction of rays of light. The rays of light which pass from the arrow at the left of the lens have their course changed so that they cross at a point upon the right of it, and form an image of the arrow inverted. This property of a lens may be readily seen by experiment with a burning-glass or a pair of convex spectacles of considerable magnifying power.

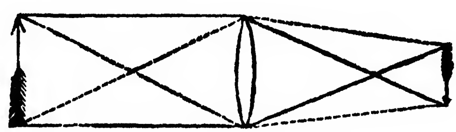


Fig. 84. Diagram showing the Optical Properties of Lenses.

How We See.—In studying the use of the eye in vision, it must be considered first as an optical instrument. As we have already seen, it contains a lens, the shape of which is similar to artificial lenses, and the effect of which in changing the direction of rays of light is precisely the same. The cornea, having a convex surface, also acts as a lens, so that there are virtually two lenses in the eye. When rays of light from an object fall upon the cornea, they pass through it and on to the crystalline lens with a different direction from that in which they were received, being brought nearer together, or made to converge. Passing on to the lens, they are by it made to converge still more, so that they cross just behind the lens and form an image, reduced in size and inverted, upon the retina. This may be

seen in the eye of an ox taken from the animal immediately after it is killed. By removing the outer coverings at the back part with great care, leaving the retina in place, and then placing it in such a position as to receive a strong light from some object, the object may be seen pictured upon the retina upside down.

The delicate nerve cells and filaments which form the retina convey the impressions thus made upon them to the base of the brain to the nerve center having charge of sight, whence they are communicated to the cerebrum, and the sensation of sight is produced, or the impressions recognized by the brain. Any sort of irritation of the retina or optic nerve will occasion the sensation of light, whether it be mechanical, or electrical by means of a battery.

Accommodation of the Eye. — An opera-glass, when used for viewing objects at different distances, must be adjusted in order to give distinct images of the objects viewed. If turned upon a distant object when rightly adjusted to make a near object distinct, the distant object will appear blurred and indistinct, if seen at all. Like the opera-glass, the telescope, and other similar optical instruments, the eye has an adjusting apparatus. The use of this adjusting mechanism is what is known as accommodation. By its use the healthy eye can be so adjusted as to see with the greatest possible degree of distinctness objects at the extreme limits of vision, as well as objects very near to the eye. This power differs with different persons in accuracy and in the extent of its limits. A near-sighted person has a very small range of accommodating power, that is, he can see clearly only objects which are within narrow limits of distance.

A very simple experiment will make clear to all what is meant by accommodation. Place in a strip of wood two or three feet long, two pins in range with each other, one at either end of the strip. Now hold the strip out horizontally at about the level of the eye, with one end toward the eye. By this arrangement one of the pins will be two or three feet farther from the eye than the other. Now look at the pin nearest the eye. While doing so it will be observed that an indistinct view is also obtained of the pin at the other end, and that it looks blurred. Then look sharp at the pin at the farther end. The pin nearest the eye will now appear blurred and indistinct. This is because the eye cannot accommodate itself to more than one distance at a time. Another interesting experiment shows the same thing in a different way. Make in a card-board two small holes about the dis-

tance apart shown in Fig. 85, in a horizontal line with each other. Place the card very near to the eye, and hold vertically in the fingers a needle at a distance of eight or ten inches from the eye. When the eye is fixed intently upon the needle, it is seen clearly; but if the attention be directed to an object either farther away or nearer by than the needle, it will appear indistinct and also double. If moved near enough to the eye, it will appear double continually. The nearest point at which it appears single is the near limit of accommodation.

Accommodation is accomplished by the action of the ciliary muscle, by means of which the form of the lens, and hence its refracting power, is changed, as shown in Fig. 86.

Visual Judgments.—With the exception of the auditory sense and the sense of sight, all others of the senses require for their excitation the actual contact of something. No other sense gives us so much and such varied information respecting external things as the eye; yet a careful study of the knowledge thus gained shows us that the eye is very greatly aided by the other senses. Indeed, with only the sense of sight, we should be very badly off indeed, and the function of sight would render us but little service. In making visual judgments, or forming opinions which seem to be

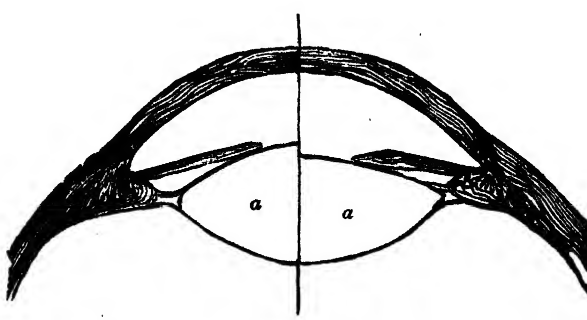


Fig. 86. At the right of the vertical line, the lens, *a a*, is shown flattened, as when adjusted for seeing at a distance; on the left, the lens is thickened, as in near-sighted persons and when examining near objects.

based upon the impressions received through the eye, we never take into account our dependence upon other senses, because we are scarcely able to separate them under ordinary circumstances.

Judgment of Distance and Size.—The power to judge of distance is evidently acquired. The little child reaches out its hand for the moon, undoubtedly supposing it to be within easy reach. A landsman at sea for the first time can form no correct estimate of distance. The same is true of a person accustomed to live in a hilly or mountainous section when he first visits a prairie country. The judgment of distance is formed partly by the combined use of the two eyes,—one serving as a means of correcting the other,—by the amount of muscular effort required to accommodate the eye to see the objects clearly, and by the relative size of objects with which we are familiar. For instance, we are familiar with the size of a man or a horse; if we see a man or a horse some distance away, we judge something of the distance by the apparent size. If we were to look through a reversed telescope, which makes everything look small, we should have the same impression, that of a person a long distance off, even though he might be very close by. The advantage of using both eyes in judging of distance is well appreciated by one who attempts to thread a needle with one eye closed.

We are aided in judging of the size of an object by a knowledge of its distance. We can form no notion of the size of the moon, because we can form no visual estimate of its distance, and *vice versa*.

Judgment of Solidity.—We are enabled to form an opinion respecting the solidity of an object by two means; first, by means of the lights and shades of its surface, and second, by the conjoined use of the two eyes, which enable us to see more than half of a sphere, owing to the difference in position of the two eyes.

It is thus evident that we do not form opinions respecting objects exactly as we see them, but as the impressions of sight are corrected by comparison with each other and with the impressions received through the other senses.

Curious Facts about the Sense of Sight.—There are many curious facts about sight well worth mentioning, only a few of which we have room to consider. First we may mention that although every one is familiar with the fact that color as well as simple light may be appreciated by the eye, no explanation has yet been found for the power to distinguish color. The color of objects is due to the fact

that light is compound, and that some objects have the power to absorb some portions of the constituent elements of light and reflect others, the elements reflected determining the color. For example, an object reflecting red rays only, is red; one reflecting blue only, is blue, etc. It was formerly supposed that red, yellow, and blue were the primary colors, or color sensations; but an eminent scientist has recently shown that the old view is incorrect, and that the primary color sensations are red, green, and violet. When all three of these colors fall upon the retina at once, white or colorless light is produced. By their combination in various proportions all other color sensations may be produced. White may also be produced by combining the following colors: red and blue-green; orange and blue; yellow and indigo-blue; green-yellow and violet; purple and green.

After-Images.—After looking at a bright object, as the sun, for a few seconds, and then closing the eyes, the image formed on the retina will persist for some time. The same phenomenon may be noticed in the morning when the retina is rested. If upon first waking a person looks at the window, he may, upon closing his eyes, still retain the image with all the distinctness with which the objects viewed were seen when the eyes were open, the same form, color, and other visual properties being accurately preserved. Such images as these are known as positive after-images. A more usual form of after-image is that which is produced by looking upon a white ground after the eye has been for some time steadfastly fixed upon some dark or colored object. If a person has been looking at a white spot upon a dark ground, upon looking at a white ground, as the wall, he will see a dark spot of the same size and form as the light spot. When the spot is of a red color, the image seen on the white ground will be greenish-blue, which is the complement of red. Orange produces blue; green, pink; yellow, blue; etc. The explanation is that the part of the retina upon which the image of the object is formed becomes weary with receiving the particular sensation, and consequently while the rest of the retina which is fresh receives a sensation corresponding to the color of the object viewed, the tired spot responds to but a part of the rays, and so shows a different color, really making a physiological decomposition of the rays of light. Images of this sort are called negative.

The Blind Spot.—The portion of the retina which possesses most acute vision is the visual center, which is a little to one side of the point at which the optic nerve enters the eye. The point of entrance of the

optic nerve is wholly insensitive to visual impressions, as there are at this point none of the terminal elements of the optic nerve, which alone possess the power of receiving impressions. The existence of this insensitive portion of the retina, commonly termed "the blind spot," can be easily shown by a simple experiment with Fig. 87. Holding the book

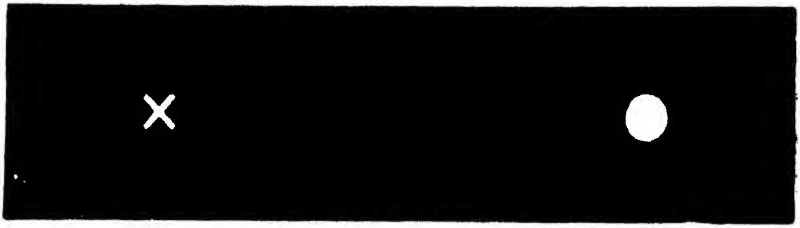


Fig. 87.

squarely before the face and so that the figure will be on a level with the eyes, place the hand over the left eye, and with the right eye look steadily at the small cross at the left end of the figure. Now place the book at a distance of about four inches from the eye. Both the cross and the round white spot will be distinctly visible; but as the book is moved from the face the white spot will disappear at a distance of six to eight inches. With a little care any one can perform the experiment. Another way of showing the same fact without the figure is this: Pin two cards upon the wall about two feet apart, and on a level with the eyes. Now close the left eye and look at the left card with the right eye, or *vice versa.* Both cards will be visible, the right one indistinctly, of course. Keeping the right eye fixed upon the left card, walk backward. At a distance of six to eight feet from the cards the right one will vanish.

Contrast.—A white stripe placed between two black stripes looks much whiter at its edges than in the middle, which may even look a little dull in contrast with the edges, though the color is uniform. A small sheet of gray paper placed in the middle of a larger sheet of green paper and covered with a sheet of thin tissue paper, appears of a pink color, which is complementary to green.

HYGIENE OF THE SPECIAL SENSES.

The Law of Use and Abuse.—Sensation is due to change of state. If the external agents which make impressions upon our organs of sense remained always in the same relation to them, we should possess sensibility or sensation but a very brief space of time. Our sensations arise from the constant changes in the relations of surrounding objects to our organs of sense. For example, an object laid upon the hand resting upon a table is at first appreciated by the sense of weight or pressure. At the first moment of contact the most intense sensation is experienced; after this the impression gradually diminishes, until finally the object is no longer felt at all unless the hand is moved. If the hand be placed in water which the sense of temperature at first appreciates as warm, it very soon loses the sensation of contact with water altogether unless the hand is stirred. Flavors at first very marked, when the sapid substance is held some time in the mouth become less intense. The most sensitive nose may become so accustomed to foul odors that it can no longer appreciate them. This is experienced by every person who leaves a close room for a few minutes and walks in the pure air. Upon returning, the close, fusty air is almost intolerable; but in a few minutes it is no longer noticed. Loud sounds are no longer heard by ears constantly accustomed to them, unless they are varied, or the attention is especially called to them. An object continually gazed at finally disappears from view.

Thus all sensation depends upon constant change of state. From this fact we may deduce the general law relating alike to all the senses, that frequent change is essential. Too long use of any of the senses in any particular way should be avoided, as by this means their sensibility is blunted.

Evils of Excessive Stimulation of the Senses.—Excessive stimulation of any sense is felt as pain, when extreme in degree. A sensation of warmth is pleasurable, but neither extreme cold nor extreme heat is felt as intense heat or cold, but as pain. Very loud sounds, as the noise of an explosion, are avoided as painful to the ear. Moderate light is grateful to the eye, but an intense light, as that of the sun, causes pain. Pain is a faithful sentinel of danger; and so, as might be supposed, these intense stimulations of the nerves of sense are harmful, and should always be avoided when possible. When experienced, they

rapidly deteriorate the sensitiveness of the organ involved. A tongue accustomed to the strong flavors of highly seasoned food, ceases to appreciate the delicate flavors which naturally pertain to most articles of diet in a less artificial condition. Hence the evil of condiments. Smoking, tobacco-chewing, tea-tasting, and the excessive use of tea and coffee, as well as the use of strong alcoholic liquors, deteriorate and often almost wholly obliterate the sense of taste.

The sense of smell is often entirely lost in consequence of the vile habit of snuff-taking. The habit sometimes acquired by smokers, of expelling tobacco smoke through the nose, ruins the delicate sense of smell. The nerves of this sense, being more slightly protected than any other, are very easily injured. Nasal catarrh also obliterates the sense of smell in many cases.

When we consider the great importance of most of the special senses, and the great value of all, it is indeed surprising that so little pains is taken to preserve them. Too often their value is not appreciated until they have been ruthlessly squandered by careless habits, and are in many cases irrecoverable. On account of their great importance, we shall devote a little space to the special consideration of the senses of sight and hearing.

HYGIENE OF THE EYE.

Being one of the most delicate of all the organs of sense, the eye is exceedingly liable to injury by improper use or exposure. Dr. Edward G. Loring, an eminent oculist of New York City, makes the following excellent remarks on this subject :—

Common Neglect of the Eye.—"Whatever an ounce of prevention may be to other members of the body, it certainly is worth many pounds of cure to the eye. Like a chronometer watch, this delicate organ will stand almost any amount of use, but when once thrown off its balance, it can very rarely be brought back to its original perfection of action, or, if it is, it becomes ever after liable to a return of disability of function or the seat of actual disease. One would have supposed from this fact, and from the fact that modern civilization has imposed upon the eye an ever-increasing amount of strain, both as to the actual quantity of work done and the constantly increasing brilliancy and duration of the illumination under which it is performed, that the greatest pains would have been exercised in maintaining the organ in a condition of health, and the greatest care and

solicitude used in its treatment when diseased. And yet it is safe to say that there is no other organ in the body the welfare of which is so persistently neglected as the eye.

"I have known fond and doting mothers to take their children of four or five years of age to have their first teeth filled, instead of having them extracted, so that the jaw might not suffer in its due development, and become in later years contracted; while the eye, the most intellectual, the most apprehensive, and the most discriminating of all our organs, receives not even a passing thought, much less an examination. It never seems to occur to the parents that the principal agent in a child's education is the eye; that through it it gains not only its sense of the methods and ways of existence of others, but even the means for the maintenance of its own; nor does it occur to the parents for an instant that many of the mental as well as bodily attributes of a growing child are fashioned, even if they are not created, by the condition of the eye alone.

"A child is put to school without the slightest inquiry on the part of the parent, and much less on the part of a teacher, whether it sees objects sharply and well defined, or indistinctly and distorted; whether it be near-sighted or far-sighted; whether it sees with one or two eyes; or finally, if it does see clearly and distinctly, whether it is not using a quantity of nervous force sufficient after a time not only to exhaust the energy of the visual organ, but of the nervous system at large."

Tobacco a Cause of Eye Disease.—The numerous observations on the subject leave no room to doubt that the use of tobacco is a potent cause of disease of the eye. In fact, instances of nearly every functional disease of the eye have been traced to the use of this powerful poison. Amaurosis, and total blindness from degeneration of the optic nerve, have also been traced to this cause. Recent observations point to tobacco and alcohol as the great causes of color-blindness, or Daltonism, which accounts for the fact that it is very much more common in men than in women.

Effects of Poor Light.—The use of poor light, and especially the improper construction of school-rooms in relation to light, is a most potent cause of diseases of the eye. Careful examinations of large numbers of students in all grades have shown that defects of sight increase in a rapid ratio from the lowest grades to the highest, students in the higher classes in colleges and universities suffering to a most astonishing and alarming extent.

Attention should be given to the eyesight of children at an early age, and especially before they are sent to school, or before a profession or trade is chosen for them. If the sight is found to be weak or otherwise defective, they should not be compelled to close confinement with books, and should be put to learn some trade or engage in some business which will not require close attention of the eye. An eminent New York oculist has recently urged the enactment of a law requiring that all children be submitted to an examination of the eyes before being granted admission to the public schools. If this plan should be adopted, no doubt many cases of disease of the eye which become serious by neglect, might be cured by the early discovery which would be thus made.

A Cause of Near-Sightedness.—One of the recognized causes of near-sightedness is looking at near objects for too long a time without relieving the eye. The optical apparatus is, by a curious mechanism provided by nature, constantly adapted to the varying distances at which objects are viewed when the eyes are being employed in looking about at various objects. If near objects are looked at too long a time, the result will be that the particular adjustment for short distances will become a more or less permanent condition. It is in this way that watch-makers, microscopists, proof-readers, compositors, writers, book-keepers, and especially students, are so liable to this disease of the eye. It should be recognized that a near-sighted eye is really a diseased eye. The idea held by many persons that an eye which has this peculiarity is an uncommonly strong one is an error. Short-sight is an evidence of weakness and disease rather than of strength.

The following very sensible remarks referring to the prevention of this defect in school-children we quote from the *Educational Weekly*:—

"Encourage the pupil to look off the book frequently, to change the focus of sight by regarding some distant object. It is not enough to look around vaguely; the eye must be directed to something which is to be clearly seen, like a picture or a motto upon the wall, or a bit of decoration. The greatest damage to the eyes of students is the protracted effort to focus the printed page. It was simply barbarous, the way we used to be "waked" in school, when we looked off the book. It is easy for a teacher to know the difference between the resting of the eye and the idle gazing around that cannot be allowed.

I regard this as most important, and the disregard of it as most prolific of trouble."

The following excellent rules for preserving the health of the eyes have been chiefly compiled from the best authorities on the subject:—

1. Never use the eyes when they are tired or painful, nor with an insufficient or a dazzling light. Lamps should be shaded.

2. The light should fall upon the object viewed from over the left shoulder, if possible; it should never come from in front.

3. The room should be moderately cool, and the feet should be warm. There should be nothing tight about the neck.

4. Hold the object squarely before the eyes, and at just the proper distance. Holding it too near produces near-sightedness. Fifteen inches is the usual distance.

5. Never read on the cars, when riding in a wagon or street-car, nor when lying down. Serious disease is produced by these practices.

6. Do not use the eyes for any delicate work, reading, or writing by lamp-light, before breakfast.

7. Avoid much use of the eyes in reading when just recovering from illness.

8. Never play tricks with the eyes, as squinting or rolling them.

9. If the eyes are near-sighted or far-sighted, procure proper glasses at once. If common print must be held nearer than fifteen inches to the eye for distinct vision, the person is near-sighted. If it is required to be held two or three feet from the eye for clear sight, the person is far-sighted.

10. A near-sighted person should not read with the glasses which enable him to see distant objects clearly. A person who has long sight should not attempt to see at a distance with the glasses which enable him to read.

11. Colored glasses (blue are the best) may be worn when the eye is pained by snow or sunlight, or by a dazzling fire or lamp light. Avoid their continued use.

12. Never patronize traveling venders of spectacles.

13. Rest the eyes at short intervals when severely taxing them, exercising the lungs vigorously at the same time. Tired eyes may often be refreshed by bathing in cool water, or water as hot as can be borne.

14. Avoid sudden exposure of the eye to a bright light, as when first waking from sleep. Study by lamp-light before breakfast is particularly injurious on this account.

15. Defective ventilation, unequal heating,—causing cold feet and congestion of the head,—and bad food, causing impure and impoverished blood, are serious causes of diseases of the eye.

16. Popular eye-washes, and various ointments, salves, etc., prepared according to popular recipes, or sold by quacks, should never be used.

17. Upon the discovery of any defect in the sight, consult a competent physician (not a traveling quack) at once, as serious disease may be saved by timely advice or treatment.

HYGIENE OF THE EARS.

The number of people who suffer with defects of hearing in greater or less degree is almost if not quite as great as those who suffer with defective eyesight. The ears are neglected as much as the eyes; but, fortunately, slight impairment of hearing is not accompanied by anything like so great inconvenience or loss as an equal degree of impairment of vision. From inattention, neglect, and abuse, the ears become seriously or hopelessly diseased, when a little timely attention or warning might have saved them. It should be mentioned in this connection that diseases of the ear are to be avoided not only on their own account, but on account of the fact that owing to the close proximity of the organ to the brain, and its intimate connection with the bones of the skull, serious and even fatal disease not infrequently results from affections of this organ. We will call attention to some of the most important points connected with the hygiene of the ear.

Danger of Meddling with the Ears.—The common habit of picking at the ears to remove the wax or cerumen which accumulates in them, is very injurious. Especially bad is the use of ear-picks or spoons. Boring out the ear with the twisted corner of a towel is a most absurd as well as injurious practice, since it not only does not remove more than a very small portion of wax, but crowds the balance down into the bottom of the canal, against the delicate membrane of the drum. Except in cases of disease, ear-wax seldom requires removal, as nature has provided for this. When the ears are let alone, as they should be, the wax dries and scales off in thin flakes, which drop from the ear spontaneously. It is only in cases of disease that the wax accumulates to such an extent as to be detrimental. If there is itching of the ears, it is a sign of disease; and the more they are irritated by picking or cleaning, the worse the evil will become. The more assiduous the attempts to keep the ears free from wax, the greater will be the accumulation, as

the secretion is increased by the mechanical irritation. Well-meaning mothers often do their children a great amount of harm by attempts to keep their ears free from what nature designed as a protection. The protest which children always make to having their ears bored out with towels and scrubbed with soap and water inside as well as outside, is a perfectly natural and entirely proper resentment of the outrage. The outer parts of the ear may very properly be washed as often as desired, provided they are always wiped dry; but nothing should ever be introduced into the canal of the ear unless made necessary by disease or accident.

Putting things in the ear is a practice sometimes acquired by children, and often irreparable injury is thereby done. Children should be carefully watched, and early taught to let the ear alone. Beans, kernels of rice, wheat, and corn, and a great variety of small objects, have been removed from the ears of children by surgeons to whom they have been taken for treatment for deafness. Inflammation is not infrequently set up by this means, which may occasion permanent loss of hearing. Throwing at each other wheat, sand, and other small objects, should be strictly forbidden children, and should never be practiced by any one. We recently met a gentleman whose hearing in one ear was wholly destroyed when a child by having lodged in his ear a kernel of wheat from a handful thrown at him by a playmate. It was never extracted, and the inflammation excited caused a permanent loss of hearing.

Danger of Boxing the Ears.—The common practice of cuffing the ears is not only cruel but dangerous. The violent forcing of air into the ear in this manner has often caused rupture of the delicate drum membrane. Sometimes serious inflammation is occasioned; and in one case which we have in mind a child died from the effects of a cuff upon the ear received at school. Both parents and teachers often box or cuff the ears of children for inattention, when it will be found in a large number of cases in which a child is apparently inattentive that the difficulty is hardness of hearing, which will of course be made worse instead of being remedied by the punishment inflicted. It should be understood and remembered that the hearing of children is often temporarily impaired by various causes, particularly by colds and attacks of "earache," and also that in some forms of deafness a person may be quite hard of hearing when not expecting to be spoken to and hence not giving attention, and yet hear very well when listening. Before a child who seems to be habitually inattentive is punished for the supposed fault, his

ears should both be carefully tested by trying each one alone with a watch, or by speaking in a moderate tone of voice at different distances.

Taking Cold in the Ears.—The form of ear disease known as throat deafness is that in which the impairment of hearing is really due to disease of the throat, and is most commonly caused by taking cold. The thickness of hearing due to a common cold in the head is occasioned by the thickening of the mucous membrane about the openings of the Eustachian tubes in the throat. This usually passes away in a short time; but in case of catarrh, especially post-nasal and pharyngeal catarrh, the condition may become permanent; and the local disease may extend up into the canal and even to the ear itself, occasioning very great injury to the ear.

It ought to be generally known, too, that the very common affection called earache is really a matter of quite serious character, being inflammation of the middle ear, or drum of the ear. Treatment should be prompt, and care should be taken to prevent recurrences, as the hearing may be thereby permanently injured. Full directions for treatment are given in the proper place.

Exposure of the Ears.—Both extremes should be avoided in the case of the ears. Too much protection makes them delicate and easily disturbed by the occasional exposures to which they must be subjected. It is probably for this reason that women are more liable than men to suffer with acute inflammation of the ear, as has been observed by some aurists. People who always have their ears covered or protected by plugs of cotton, are quite sure to be always troubled with their ears. The ears should be accustomed to exposure, and only protected when subjected to some unusual exposure, as when riding a long distance in a cold wind. The use of cotton in the ears is attended by some risk, being often productive of harm, as cotton placed in the ear is not infrequently forgotten, being left in place, and even pushed farther into the ear by successive plugs. As many as three pellets of cotton which had been successively inserted in this way have been removed by an aural surgeon. When thus retained, wax accumulates about the cotton, and thus may occasion mechanical obstruction to hearing, and serious inflammation.

Cold water should never be introduced into the ear. When injected with a syringe, and even when poured in, it causes giddiness, and may give rise to inflammation. Boys often cause an inflammation of the ear by "going in swimming" or ducking the head in wa-

ter. By submergence of the head the external canals are filled with water, which is usually of a temperature lower than that of the blood, which causes congestion and may occasion inflammation. Early deafness is often produced in this way. Those who own dogs which are accustomed to go into the water much, or are often thrown in, frequently find that they become deaf in consequence.

Wetting of the hair is a cause of injury to the ear, as well as wetting the ear itself. The practice is especially harmful in cold weather. Care should be taken to dry the hair, especially near the ears, whenever it is wet.

It is well to protect the ear from loud sounds, which are especially liable to cause injury if unexpected. When anticipated, the drum membrane is prepared by the action of muscles for the purpose, so that injury is less likely to occur. Persons have been made stone deaf by confinement in a belfry during the ringing of a large bell. Artillery-men often lose their hearing in consequence of the loud noises to which their vocation exposes their ears. Even shouting loudly in the ear has been known to produce injury. A bit of cotton placed in the ear will do much to deaden sound.

One other caution should be given in conclusion. The attempt is sometimes made to relieve toothache by placing in the ear cotton saturated with camphor, chloroform, or other medicaments. While this mode of treatment is sometimes successful, the plan is not a good one, as the injury done to the ear may be greater than the benefit received by the tooth. Both the tooth and the ear should be treated on their own merits, each for its own maladies, unless the other be implicated as a cause.

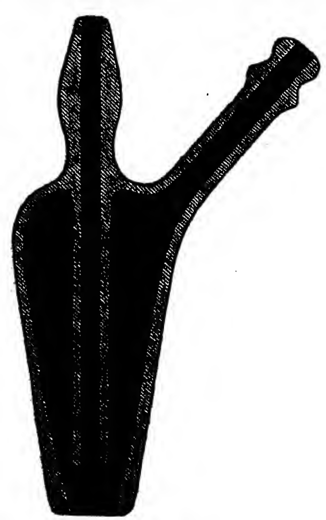


Fig. 87½.

Full explanations respecting the use of ear-trumpets and other means of aiding impaired hearing are given in connection with the subject of deafness.

An excellent device for administering an ear douche is illustrated in the accompanying cut. Fig. 87½. A stream of warm water is passed through it by means of a fountain syringe held on a level with the top of the head. The water is conducted away by a second tube attached to the lower orifice.

THE CIRCULATORY APPARATUS.

The organs of circulation, or the circulatory apparatus, constitute the means by which the blood, the nutritive fluid of the body, is circulated through all its different parts, carrying new material to parts requiring it for repairs, and carrying away to be expelled from the body worn-out and useless or clogging elements wherever found. The circulatory apparatus consists of the *heart*, the *blood-vessels*, and the *lymphatics*, the structure and functions of which we will now briefly examine.

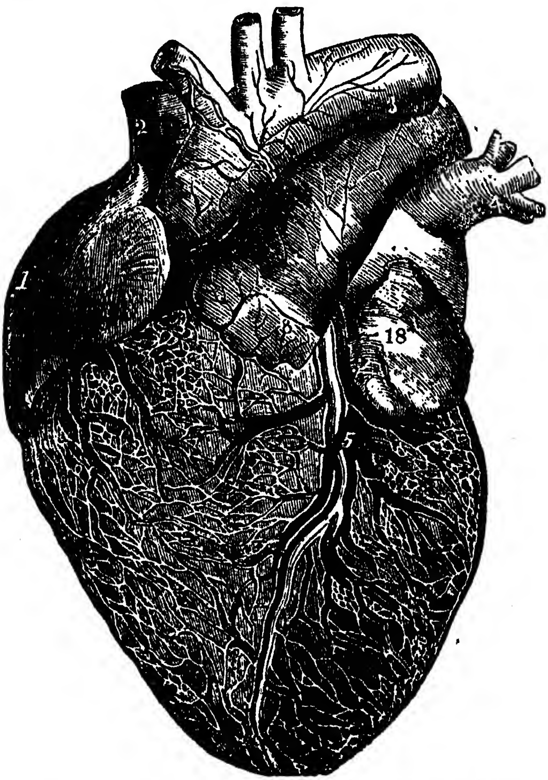


Fig. 88. The Heart. 1. Right Auricle; 18. Left Auricle; 2. Vena Cava; 3. Aorta; 4. Pulmonary Veins; 5. Coronary Artery and Veins; 8. Pulmonary Artery.

The Heart.—Fig. 88. The heart is the central organ of the circulation, and hence is very properly placed near the center of the body, in the thorax, its exact position being a little to the left of the median line in the central part of the chest, between the two lungs. The heart is a muscular organ. It is, in fact, a hollow muscle. It is conical in shape, and is suspended in the chest, with the base upward and the apex downward. The apex is free, and when the heart is beating, may be felt to strike the chest just below the fifth rib

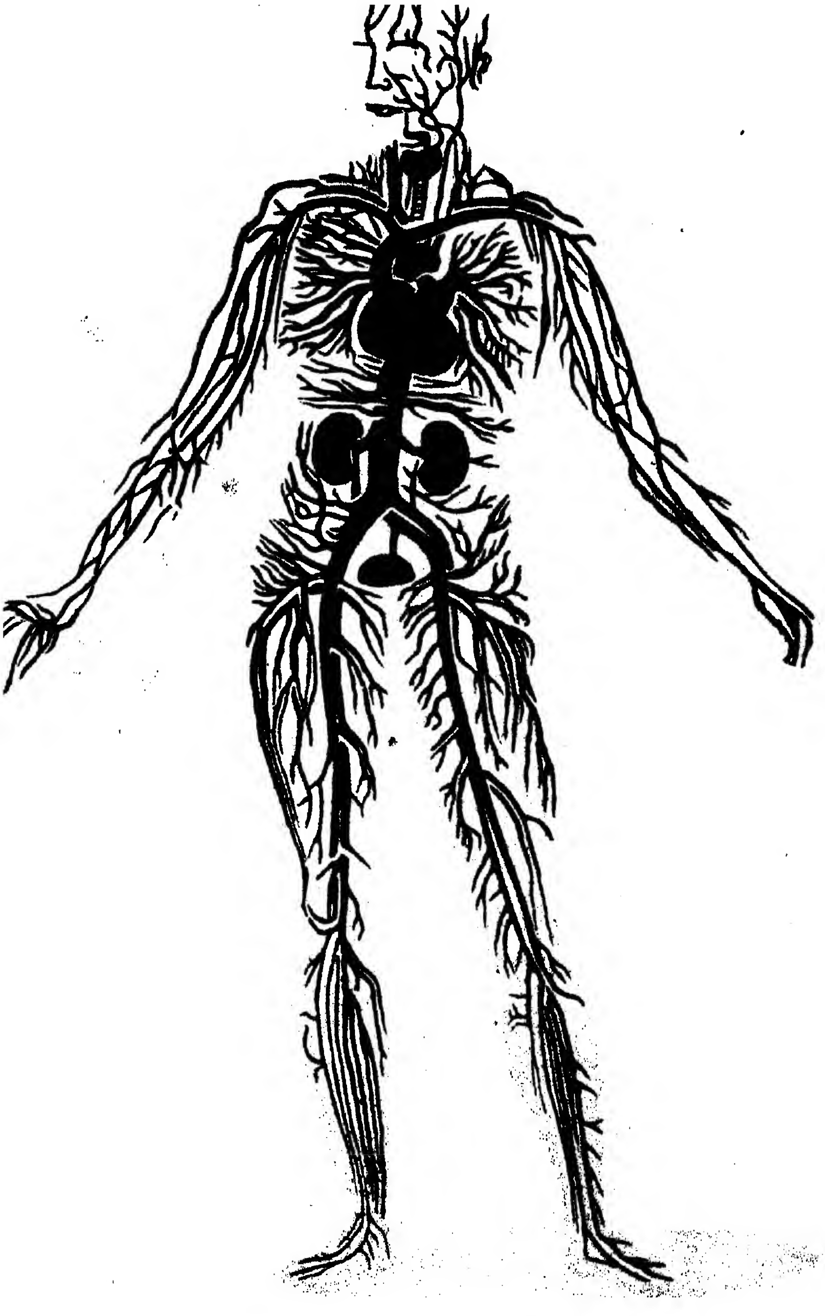


Plate V.—*THE CIRCULATION.*

and about one and one-half inches to the left of the breast-bone. The weight of the heart is ten to twelve ounces in men, and eight to ten in women. The heart is really a double organ, and may properly be considered as two hearts joined together. See Fig. 89. In some lower animals the two hearts are separate. See Fig. 90. The two hearts are called, respectively, the right heart and the left heart. Each heart has two cavities, a lower, called the *ventricle*, and an upper, called the *auricle*, on account of its ear-like appearance.

Fig. 89. Diagram showing the two sides of the Heart and their cavities.

The walls of the left ventricle, or the lower cavity of the left heart, are very much thicker than those of the right ventricle. A diagram of the cavities is shown in Fig. 89.

Valves of the Heart.—The auricle and the ventricle of each heart communicate with each other, but there is no direct communication between the two hearts except in the infant before and just after birth, when there is an opening between the two auricles. This opening between the auricle and ventricle in each heart is guarded by a valve which allows the blood to pass from the auricle into the ventricle but not back into the auricle. The valve in the left heart is called the *mitral*, or *bi-cuspid*, having two cusps, or curtains. The valve in the right heart, having three cusps, is called the *tri-cuspid* valve. See Fig. 91.

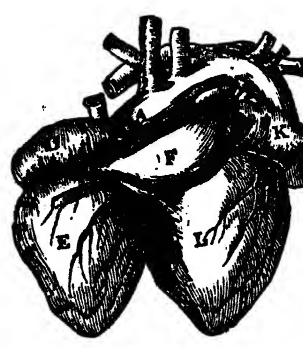


Fig. 90. The Double Heart of the Dugong.

Each of the cavities of the two hearts communicates with blood-vessels, the auricles communicating with

Fig. 91. The Heart with portions of its walls removed, showing interior of cavities. 6. Tri-Cuspid Valve; 10. Mitral Valve; 12. Semi-Lunar Valve.

veins, and the ventricles with arteries. The openings between the ventricles and arteries are also guarded with valves upon both sides, which from their half-moon shape are termed *semi-lunar* valves. The left semi-lunar valve guards the opening between the left ventricle and the *aorta*. The right semi-lunar valve guards the opening between the right ventricle and the *pulmonary artery*. The veins have no true valves at their openings into the auricles, but are slightly constricted.

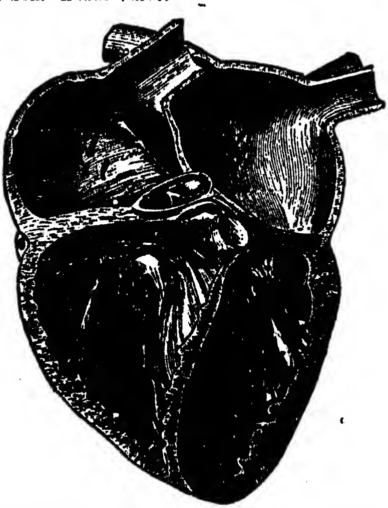


Fig. 92. Section of the Heart, showing relative size of its cavities, and thickness of the walls of the ventricles.

The Pericardium.—The heart is contained in a delicate sac called the heart-case, or *pericardium*, the lining membrane of which secretes a fine lubricating fluid to secure the utmost ease of action. The heart is lined with a delicate membrane, the *endocardium*, which is continuous with the lining of the blood-vessels.

The Blood-Vessels.—There are three classes of blood-vessels,—arteries, capillaries, and veins. The arteries differ from the veins in having rigid walls,

which are in the large arteries chiefly composed of connective tissue, but in the smaller ones contain a large proportion of involuntary muscular tissue. The smallest arteries, called arterioles, have their walls almost wholly made up of muscular tissue. The arteries derive their name from the fact that they are found empty after death, which led the ancients to suppose they were simply ducts for air. Fig. 93 gives a general view of the arterial system.

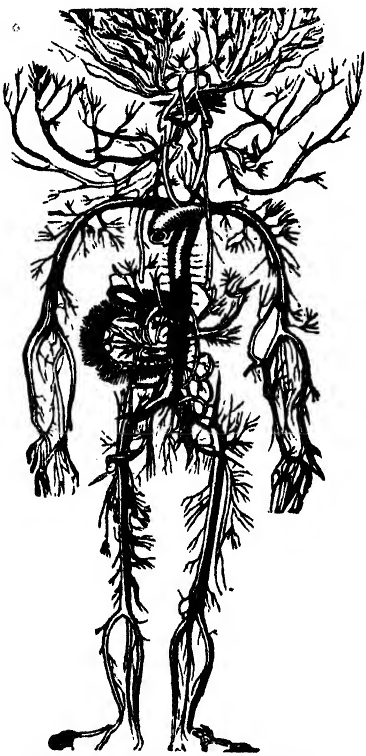


Fig. 93. The Arterial System.

Names of Some of the Principal Arteries.—The following are the names of some of the principal arteries of the body:—

The *aorta* is the great artery of the body. It starts at the left ventricle, and subdivides into numerous branches in the various parts of the body through which it passes. Arching upward as it leaves the heart, the aorta sends off large branches which supply blood to the head and upper extremities. The chief of these are the *innominate*, the *carotid*, and the *subclavian*. The first two supply the right arm and the head, and the third the left arm. In the arms the arteries become first the *brachial*, which divides in the fore-arm into the *ulna* and *radial*, the ends of which unite in the hand to form an arch in the palm, known as the *palmar arch*.

As it passes downward through the chest, the aorta gives off branches to the lungs and other organs contained in the thorax. In the abdominal cavity, branches are given off to the abdominal organs, the stomach, pancreas, spleen, intestines, liver, kidneys, and other viscera. In the pelvis the aorta divides into two branches, one of which goes to each of the inferior extremities, the plan of distribution in the lower limbs being similar to that in the arms.

The large pulmonary artery which leaves the right ventricle is distributed wholly to the lungs.

The Capillaries.—These are the smallest of the blood-vessels. They are so very small that they can only be seen with a good microscope. Their walls consist only of the lining membrane of the arteries. They form an intricate meshwork through all the soft tissues of the body. The size of the capillaries is generally not more than $\frac{1}{3000}$ of an inch, and sometimes less.

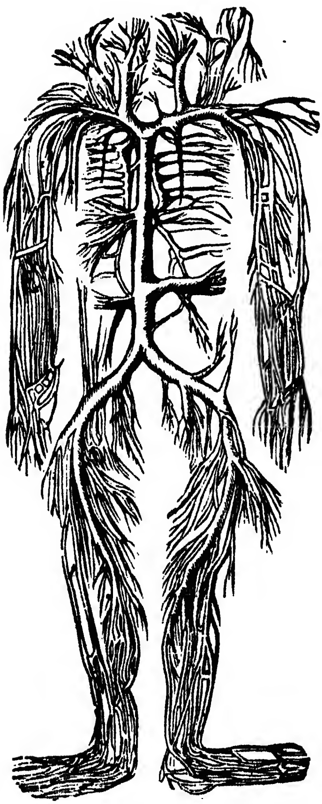


Fig. 94. The Venous System.

The Veins.—The veins begin with the capillaries, and gradually increase in size as they approach the heart, by the joining together of branches from different parts of the body. The veins differ from the arteries, 1. In being more numerous, there usually being two veins for one artery; 2. In having flaccid walls which collapse when they are not filled; 3. In having little or no muscular fibre in their walls, so that they cannot contract as do the arteries; 4. In having valves in some parts of the body which allow the passage of blood in only one direction,—toward the heart; 5. In communicating freely with each other by connecting branches. The location of the valves can be readily seen by tying a cord around the arm, thus interrupting the flow of blood. In a few seconds the veins of the hand and arm will be very much swollen with blood, and at regular intervals along the vein, about an inch apart, will be noticed little prominences which mark the location of valves. Fig. 94 gives a general view of the Venous System. The valves are well shown in Figs. 95 and 96.

The veins usually correspond in name to the arteries which they accompany. A few of the most important are, the ascending and descending *venæ cavæ*, which gather all the blood from the veins of the upper and lower parts of the body respectively; the *innominate*, which collects the blood from the head and upper extremities; the *jugular*, which returns blood toward the heart from the brain and

head; the *portal* vein, which collects the blood from the stomach, pancreas, spleen, and intestines, and conveys it to the liver; the *hepatic* vein, which conveys blood from the liver to the ascending *vena cava;* and the four *pulmonary* veins, which convey the blood from the lungs to the left auricle of the heart. For a representation of the system of blood-vessels, see Fig. 93.


Fig. 95. Fig. 96.

FIG. 95. Valves of veins closed.

FIG. 96. Valves of veins as they appear when a vein is slit open.

Action of the Heart.—Like all other muscles, the function of the heart is to contract. In doing so it expels from its cavities the blood contained in them, just as water is pressed out of the rubber bulb of a syringe. Each portion of the heart goes through a rhythmical action of contraction and dilatation, the two hearts, or right and left side of the heart, if it be considered as one, acting together. The auricles, contracting, send the blood which they contain through the mitral and tri-cuspid valves into the ventricles. When the ventricles contract, they send their blood through openings guarded by the semi-lunar valves into the aorta and pulmonary artery. This action is shown in Figs. 97 and 98.

This action of the heart occurs about seventy-two times a minute, or four times for each respiration, and is called the heart-beat.

Fig. 97. Diagram showing Valve between Auricle and Ventricle open, and Semi-lunar Valve closed, allowing the Ventricle to fill.

Heart Sounds.— The beating of the heart is accompanied by two sounds, the first of which is produced by the striking of the apex of the heart against the wall of the chest, by the muscular contraction of the heart, and by the closing of the valves between the auricles and the ventricles. The second sound is a short click made by the semi-lunar valves as they close together after the blood has been forced from the ventricles into the arteries, to prevent its return into the heart.

Amount of Work Done by the Heart.—Various estimates have been made of the force exerted by the heart in driving the blood through the arteries. Recently it has been shown very conclusively that the left ventricle exerts a force of no less than fifty pounds in its contraction, that of the right ventricle being only about one-third as much, and the auricles about one-tenth as great. Adding together the force exerted by the different portions of the heart at each beat, we have an aggregate of over seventy-five pounds. By this is meant that the heart exerts, each time it beats, a force as great as would be required to lift seventy-five pounds a foot high. To ascertain the amount of work done by the heart, then, we have only to multiply the amount of work done at each beat by the number of beats in a given time. The average rate is seventy-two beats a minute, which would be 4,320 an hour, and 103,680 in a day of twenty-four hours. Multiplying the last amount by seventy-five, gives us 7,776,000 pounds as the entire work done by the heart during one day, which is equivalent to lifting 3,888 tons a foot high in a minute. This amount seems so enormous as to be almost incredible; but there is no doubt of the correctness of the estimate.

Fig. 98. Diagram showing Valve between Auricle and Ventricle closed, and Semi-lunar Valve open, allowing blood to pass into the Arteries.

The wonderful vitality of the heart is shown not only by the amount of work done by it, but by the remarkable tenacity of life which it manifests, continuing to work under the most embarrassing circumstances, as in disease, and when other important parts of the body have ceased to act. In cold-blooded animals it will even continue its rhythmical contractions for hours after the animal is killed and the heart taken from the body. The heart of a turtle can be made to contract more than twenty-four hours after being removed from the body of the animal.

Although the heart seems to be in such constant activity, some

part of it is always at rest, each acting part taking a short rest after each contraction before acting again. The heart in this way obtains nine or ten hours of rest out of each twenty-four.

The Pulse.—When the heart contracts, a wave-like impulse is sent throughout the whole arterial system, traveling from the heart to the remotest part of the body in about the sixth part of a second, so that it is practically instantaneous. Where the arteries come near the surface, this impulse may be felt, and is called the pulse. The most convenient place for feeling the pulse is in the radial artery just above the wrist, on the outer or thumb side of the arm. It may also be felt in the carotid artery of the neck, the temporal artery of the temple, and in many other localities.

Fig. 99. Tracing of the Pulse obtained by the Sphygmograph.

An ingenious instrument known as the *sphygmograph* is in use, by which the character of the pulse may be more carefully studied than with the finger. The tracing shown by the white lines in Fig. 99 we obtained with one of the latest and most approved forms of the instrument. The tracings obtained in disease differ greatly from those of health. As the pulse is really an index to the condition of the heart, it becomes also a good indicator of the general condition of the system, and much valuable information can be gained from its careful study. The various indications of the pulse are given elsewhere.

Frequency of the Pulse.—The pulse, of course, corresponds exactly with the heart-beat in frequency, and whatever modifies one affects the other as well. The usual average rapidity is about seventy-two beats a minute. This rate is very considerably modified by various influences, some of which may be mentioned with advantage.

1. The frequency of the pulse greatly depends upon the age. At birth the pulse rate is 136; from two to seven years, 97; fourteen to twenty-one, 76; twenty-eight to thirty-five, 70; fifty-six to sixty-three, 68; seventy-seven to eighty-four, 71. In females the pulse is seven to ten beats faster than in males. The average rate of pulsation in males, from two to eighty years, is 73; that of females is 82.

Fig. 100. A Diagram of the Circulation. 1. Left Ventricle; 2. Right Ventricle; 3. Liver; 4. Spleen; 5. Intestines; 6. Stomach: 7. Pancreas; 9. Urinary and Sexual Organs; *a.* Aorta; *r r.* Lungs; *a.* Pulmonary Arteries; *v.* Pulmonary Veins.

2. Posture modifies the pulse rate. For example, it has been found that the pulse of a person whose heart beats 66 times a minute while lying down will be about 71 when sitting, and 81 when standing.

3. The frequency of the pulse is affected by temperament. In some persons the pulse is naturally much more rapid than in others. Some persons have remarkably slow pulses. Both Napoleon and Wellington had pulses remarkable for their slowness, not averaging more than fifty beats a minute. We once met a case, that of a young lady, in which the pulse was but thirty-two; another patient, a young man who was in a very debilitated condition, we found with a pulse of but thirty.

4. Digestion increases the heart-beat from five to ten per minute. The increase in frequency of the pulse is particularly marked after a meal consisting largely of flesh food.

5. The influence of exercise upon the heart's action is very great. A person whose pulse is 68, after a slow walk will have a pulse of 78; after walking at the rate of four miles an hour, 100; and after a rapid run, 140 to 150. In children and women the pulse is considerably slower during sleep than when simply reclining while awake. In adult males there seems to be no difference.

6. The heart's action is greatly accelerated by a high temperature, and is retarded by cold. A Turkish or Russian bath or a warm full bath will occasion a very considerable increase in the activity of the heart. The pulse of persons living in warm climates averages greater than that of those living in cold climates.

A curious account is given by physiologists of a man who possessed such control of his heart as to be able to suspend its action altogether. On one occasion he remained for half an hour appearing as though dead, neither respiration nor heart action being perceptible. Several medical men were present.

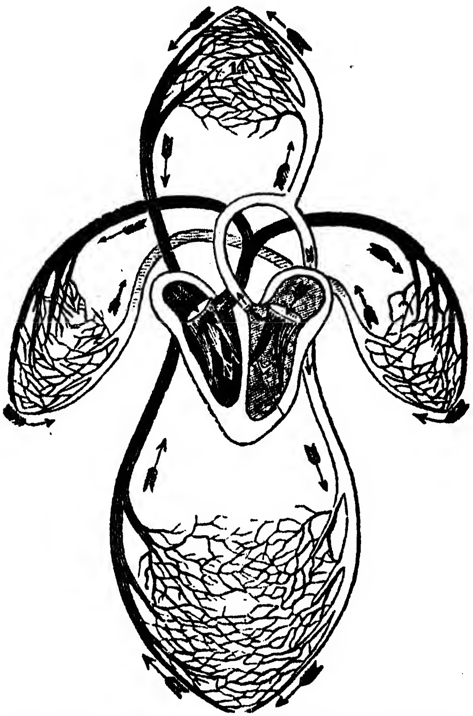


Fig. 101. Diagram of the circulation showing by means of arrows the direction of the blood current in the blood-vessels.

The Course of the Blood in the Circulation.— The circulatory apparatus of the system may be divided into three distinct circulatory systems; viz., the general or *systemic*, the *pulmonary*, and the *portal*. These three systems and their relations to each other and to the heart are shown in Figs. 100 and 101, and still better in the diagram on PLATE V. The general course of each of these three systems we will now trace.

The Systemic Circulation.—The circuit of blood for the body in general starts at the left ventricle of the heart. By the contraction of the heart the blood is forced into the aorta, and as the semi-lunar valves close tightly behind it, each succeeding contraction forces the blood farther on in the arteries until it is thus propelled to the minute capillaries of the whole body. In these the blood flows very slowly, the motion often being imperceptible. The capillaries finally merge into veins, which gradually grow larger in size and smaller in number until they finally all unite to form two great venous trunks, the *ascending vena cava*, which conveys to the heart all blood from the lower part of the body, and the *descending vena cava*, which empties into the heart all the blood from the upper part of the body. The two vessels empty their contents into the right auricle. This completes the circle of the

systemic circulation, which, as will be observed, conveys the blood from the ventricle of the left heart to the auricle of the right heart.

The Pulmonary Circulation.—In order to provide for its purification, we have a second system through which the blood is circulated. In this system the blood which is received into the right auricle from all parts of the body is forced by its contraction into the right ventricle, whence it is forced into the pulmonary artery. This artery conveys it to the lungs and distributes it in a special set of capillary vessels in which it undergoes purification, and is then, by means of the pulmonary veins, conveyed back to the heart, which it enters at the left ventricle. It is thus seen that the pulmonary circulation forms a circuit for the blood from the right ventricle of the heart to the left auricle, whence it enters the left ventricle and again begins its round in the systemic circuit.

The Portal Circulation.—This system is really a subdivision of the systemic circulatory system. The blood which is distributed to the stomach, intestines, pancreas, and spleen, instead of returning with the rest of the blood of the general system direct to the heart by means of veins and the vena cava, is collected from all these organs by a large vein known as the portal vein, which conveys it to the liver, where it is distributed through a special set of capillaries provided to enable the liver to perform its special functions upon the blood, removing impurities, completing the work of digestion to some extent, etc. All the elements absorbed by the veins of the stomach during digestion are thus submitted to inspection before being allowed to enter the general circulation. From the liver the blood is carried to the ascending vena cava by means of the hepatic vein, and thus the portal circulation is completed.

Forces of the Circulation.—The heart, although the chief, is not the only active agent in the circulation of the blood. Several agents have part in the work, the principal of which will be enumerated as follows:—

1. *The Heart.*—As already seen, the force exerted by the heart amounts to about seventy-five pounds each beat; and although this force is sufficient to propel the blood to the capillaries, so large an amount of friction results from the immense surface over which the blood passes in the capillaries that additional force is required. Again, there is good evidence for believing that the blood will continue to circulate without the action of the heart, the arteries being always found empty when examined after death, though they must have been full

when the heart ceased its activity. In some low animal forms, too, the circulation is carried on without the aid of the heart, just as the sap is circulated in a plant.

2. *The Arteries.*—The contraction of the heart, which gives the blood a propulsive impulse, is followed up by the contraction of the arteries. The small arteries are supposed to be specially active in assisting the circulation. Some observers claim that the small arteries or arterioles keep up a constant peristaltic action, by means of which the blood is urged forward.

3. *The Capillaries.*—While the capillaries themselves are simply passive agents, the passage of the fluid part of the blood through their walls must occasion a capillary action similar to that which causes the rising and circulation of sap in trees and plants. It is claimed by some physiologists that the circulation is aided by the attraction of the walls of the capillaries for the nutritive elements of the blood. It is proven, at any rate, that blood which is well oxygenated passes readily through the capillaries, while that which contains carbonic acid is very much retarded in its progress in this part of the circulation.

4. *The Muscles and the Valves of the Veins.*—The veins are so placed among the muscles that whenever contraction of the muscles occurs they are compressed, and the blood which they contain is necessarily displaced. As it cannot pass backward, on account of the valves which close whenever a backward current is established, it must of necessity move forward. Contraction of a muscle has essentially the same effect upon it that squeezing has upon a sponge filled with water. This is undoubtedly an important aid to the venous circulation. See Fig. 102.

Fig. 102. Diagram showing how the valves of the veins aid the circulation by preventing back current.

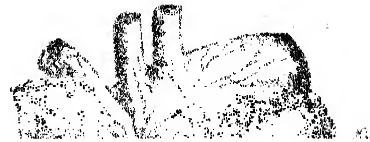
5. *Heat.*—It is probably true that in certain parts of the body, at least, the elevation of temperature which the blood undergoes in the capillaries aids the circulation by increasing its volume, the pressure of blood from behind compelling expansion in one direction, toward the veins.

6. *The Lungs.*—The lungs operate with considerable force in aiding at least a portion of the venous circulation. When the chest is expanded, and while it is filling, the pressure being partly removed from the large veins which pass through the chest, the blood rushes in to fill them. In this way much assistance is especially afforded to the circula-

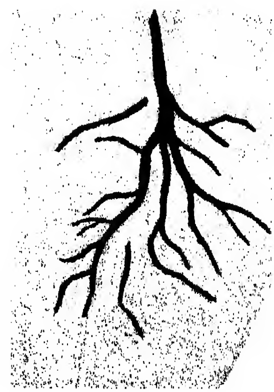
tion of blood in the liver, which is a wise provision of nature, as it will be observed, by reference to the diagram of the circulation, Fig. 100, that the blood of the portal system passes through two sets of capillaries, the double amount of friction thus produced having a strong tendency to render the circulation in the liver sluggish.

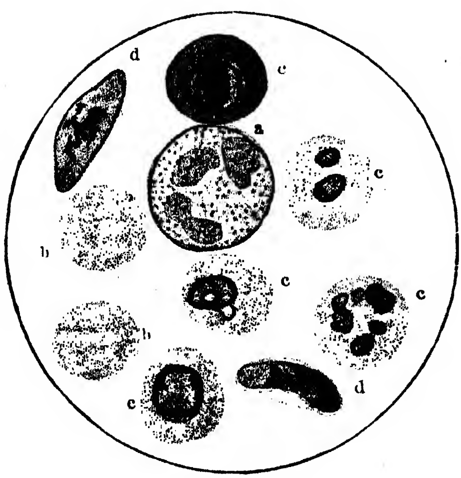
Regulation of the Circulation.—The heart's action is under the immediate control of the nervous system. Each beat of the heart is in obedience to an impulse sent to it from the nerve centers of the brain and spinal cord. In order to provide for the various exigencies which make necessary an increase or diminution of the action of the heart, two sets of nerves are provided, one of which accelerates the action of the heart, while the other slows its contractions. The first function is performed by the sympathetic nerves, the second by the pneumogastric. By the action of these nerves the supply of blood to the general system is regulated according to its wants. For example, when a person is engaged in active exercise, the muscles and nerves demand an increased supply of nourishment, which can only be furnished by an increased supply of blood. The increased waste also demands a quickened circulation to remove the products of the disintegration due to muscular activity. Hence the pneumogastric nerve releases in part its hold upon the heart, and the sympathetic nerve increases its action. Every part of the body receives an increased supply of blood, those not engaged in active exercise, to some degree at least, as well as those which participate in the activity.

Regulation of Local Blood Supply.—In addition to the nerves already referred to, there is a set of nerves which accompany the blood-vessels in their minutest subdivisions and remotest ramifications, by means of which the circulation of each organ, even each small portion of the body, is controlled. The nerves are connected with a collection of cells in the medulla oblongata known as the vaso-motor center. When an impulse is sent out from this center along any of the nerves which go out from it, the muscular walls of the small arteries to which the nerves are distributed are caused to contract, and thus a less amount of blood is allowed to flow through the part. When a slight degree of excitation of the nerves is kept up by the center, the walls of the arteries become relaxed, so that by their dilatation a much larger amount is allowed to flow through them than before. An experiment often performed by physiologists well demonstrates this action of the vaso-motor nerves. The vaso-motor nerve of the ear of a white rabbit being di-

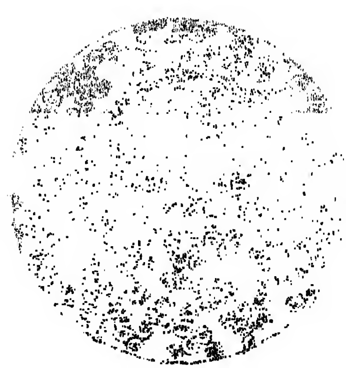


A





C



D

A. Circulation in foot of frog, greatly magnified; *B.* The heart, showing the origin of the large blood-vessels; *C.* a. White blood corpuscle; b. b. red blood corpuscles; c. c. c. c. c. red blood corpuscles containing malarial parasites; d. d. corpuscles nearly destroyed by malarial parasites; *D.* Red blood corpuscles.

PLATE VI.—*THE BLOOD.*

vided, the white skin of the ear quickly becomes red, being congested with blood, the result of paralysis of the small arteries of the part. If the end of the divided nerve be stimulated by electricity, the arteries will at once contract and the skin assume its natural color.

Blushing is due to the dilatation of the small arteries of the face from the effect of certain emotions upon the vaso-motor center in the brain. The paleness due to fright and extreme rage results from contraction of the small arteries induced in the same way.

The circulation of blood in the stomach, liver, and other internal organs, as well as in all other distinct parts of the body, is controlled by dilatation and contraction of the small arteries, in the manner described.

THE BLOOD.

The blood is a fluid tissue. In the body there are tissues of all degrees of consistency, from the dense bones and tendons to the perfectly fluid blood. It is a highly vitalized fluid, not a mere chemical solution. The blood contains all the elements necessary for the building up and keeping in repair of all the various tissues of the body. In addition to nutritive elements, the blood also contains the various effete or waste products which result from the breaking down of the various tissues as the result of vital action. It not only supplies nourishment to the hungry tissues, but washes them free from the noxious products of daily waste.

The quantity of the blood has been variously estimated, the estimates varying from ten to eighteen pounds, or about half as many quarts.

Composition of the Blood.—To the unassisted eye the blood appears to be a homogeneous fluid, of a reddish color which varies from the bright red of the arterial blood to the dark purple blood found in the veins. When examined with a microscope of sufficient power, the blood is found to be made up of about equal quantities of fluid and certain minute solid bodies floating in the fluid, called blood corpuscles, of which there are two varieties, *white* and *red*, each of which we will describe.

White Blood Corpuscles.—The microscope reveals in the blood minute protoplasmic bodies, resembling drops of transparent jelly, which constitute the white blood globules or corpuscles. PLATE VI. These minute specks of life may be considered as independent individuals, since

they may be removed from the body and kept alive for weeks. A scientific writer not inaptly calls them little fishes swimming in the life-current which flows through the veins and arteries. So small are these little creatures that twenty-five hundred of them arranged in a row would make a line but an inch in length. When examined closely, the white corpuscles may be seen to have in their central portion minute granular specks. See Fig. 103.

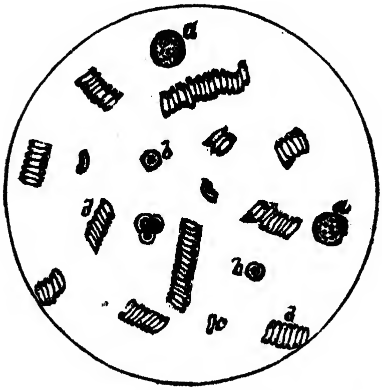


Fig. 103. Red and White Blood Corpuscles. *a.* White Blood Corpuscle; *b.* Red Corpuscle; *c.* Red Corpuscle, showing edge; *d.* Red Corpuscles in rolls, an evidence of health.

The white corpuscles originate in the spleen, bones, and lymphatic glands, in which corpuscles exactly resembling them, and known as lymph corpuscles, are found in great numbers. When carefully studied under various circumstances, they are found to undergo a regular process of growth and development like large animals, finally growing old and at last dying and being removed from the body, cast out as dead bees are thrust out from a hive by the living workers. While in their active state these remarkable little bodies exhibit many wonderful properties. Though they have no organs of locomotion, they are able to move from point to point with ease and considerable rapidity. Having no mouths, they are yet voracious eaters. Though possessing no nerves or organs of any other sort, they appear to be exceedingly sensitive to heat and cold, electricity, and other agencies which in higher forms of life are recognized by organs of sense. How these functions are performed by the white blood corpuscle,—sometimes called the animalcule of the human blood,—we need not dwell upon in detail here, as the same subject has already been more fully explained in another connection.

What are known as mucous, lymph, and pus corpuscles are apparently identical with white corpuscles.

The Red Blood Corpuscles.—Besides the white corpuscles just described, and constituting by far the largest share of the solid constituents of the blood, are found the red blood corpuscles. See

Fig. 104. Like the white corpuscles, the red are exceedingly minute, from three thousand to thirty-five hundred being required to form a row an inch in length. The red corpuscles differ from the white in several particulars. Instead of being globular, they are bi-concave and disc-like in form, being about one-fourth as thick as broad. Instead of being transparent, or gray in color, they are of a faint amber color, the red color of the blood resulting from the massing together of such immense numbers as are found in the vital fluid. It has been recently determined that there are more than 3,000,000 of these delicate bodies in a drop of blood no larger than can be made to hang upon the point of a pin. There are no less than 30,000,000,000,000 red corpuscles in the whole body. The red are much more numerous than the white corpuscles, in health, the average proportion being about 300 red to one white. The proportion of white corpuscles is greater just after a meal, and in certain forms of disease they occasionally become so numerous as to equal in numbers the red corpuscles, a condition which is very unfavorable to life.

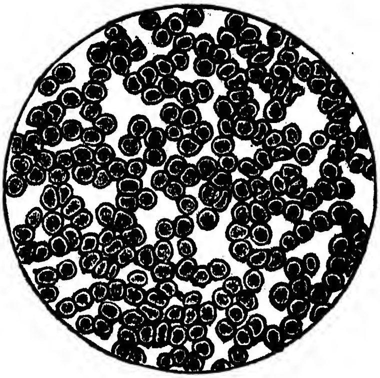


Fig. 104. Red Blood Corpuscles.

The color of the corpuscles is due to a peculiar kind of coloring matter which they contain. By means of this singular substance, as is supposed, the corpuscle acquires the power to absorb many times its own bulk of certain gases, a property similar to that possessed by fresh charcoal, which is rendered a good filtering medium on account of the large amount of condensed oxygen stored up in its pores. The color of the corpuscles differs according to the character of the gas which they are carrying, they being of a bright color when carrying oxygen, and darker when carrying carbonic acid, thus occasioning the difference in color between arterial and venous blood, as will be further explained in treating on the subject of "Respiration."

It is now understood that the red corpuscles are produced in the red marrow of the bones. Under certain conditions the corpuscles

are formed less rapidly than they should be. The consequence is the establishment of a disease known as anemia. The so-called pernicious anemia is rarely cured, as in this disease the cause of the anemia is not discoverable, and hence cannot be removed. It was formerly supposed that the red corpuscles were formed from white ones, but this theory is not tenable in the light of the most recent researches in relation to the life history of the blood-cells.

Each corpuscle acts a part in the body but a brief period, as it passes quite rapidly through its various stages and becomes useless, when it is destroyed and removed from the body. The spleen and liver seem to be the most active blood-destroying organs. The coloring matter of the blood corpuscles after their destruction is converted into the coloring matter of the bile.

The blood corpuscles of animals resemble more or less closely those of human beings. Those of the dog are so nearly like human blood corpuscles as to be scarcely distinguishable. Those of the goat, sheep, and ox are much smaller, and those of the elephant much larger than those of human beings. The corpuscles of the camel and llama are elliptical in shape, as are also those of birds, reptiles, and fishes. In the three last-named classes of animals the corpuscles are bi-convex instead of bi-concave.

The Liquid Portion of the Blood.—The liquid half of the blood may be regarded as a solution of albumen, containing also small quantities of fat, certain salts, waste products, and gases.

When exposed to the air the albuminous constituent of the blood is decomposed very quickly, one portion becoming semi-solid. This is what is known as coagulation of the blood. The part which coagulates is ordinarily known as fibrine. The albuminous elements of the blood are its chief nutritive elements. From these the tissues derive the material from which they are formed. While in solution in the fluid portion of the blood, or *plasma*, they permeate every organ and tissue of the body, thus bathing with a nutritive fluid all the tissues requiring repair. It is a curious fact that the fluidity of these elements seems, in some degree at least, to depend upon their constant motion, for blood soon coagulates when stagnation occurs. Any foreign body introduced into a blood-vessel will also occasion coagulation. In inflammation and some other conditions the tendency to coagulation is increased.

The proportion of fat is ordinarily very small, being not more than

one part in twenty-five hundred of blood, or .04 per cent. After a meal consisting largely of fat, a much larger quantity may be found in the blood. In the blood of habitual drunkards, fat is also usually found in greatly increased quantities.

The various analyses which have been made for the purpose of determining the saline constituents of the blood seem to us to be less reliable than would at first appear, since they do not take into account the nature of the individual's food. We have no doubt that a large share of the so-called saline constituents of the blood are both unnatural and unnecessary elements in the quantities in which they are usually found, and that they only occur in the blood incidentally, having been taken in excess in the food, and being absorbed and carried by the blood to the various organs capable of eliminating them. This seems to be particularly true of the various compounds of soda, especially sodium chloride, or common salt, which is found in the human system almost exclusively in the blood, merely a trace being found even in the bones, the hardest of all the tissues of the body.

Functions of the Blood.—As before remarked, the blood not only supplies to the various tissues material from which they may replenish themselves, but washes them free from the poisonous products of vital activity, which are conveyed to the various organs designed to remove them. It will be interesting to consider briefly the work performed by the two varieties of corpuscles found in the blood and already described.

Function of the White Blood Corpuscles.—The principal use of the white corpuscles probably is to destroy germs which scatter the blood, and aid in repairing injuries. It is probable, also, that the white corpuscles have something to do with nutrition, since it has been noticed that they are most abundant at points where some injury has occurred or where repair is necessary for some other cause.

Function of the Red Blood Corpuscles.—The red blood corpuscles are probably the most immediately necessary to life of any of the elements of the body, if we except some of the nerve centers. This is well shown by the fact that many persons when nearly dead from loss of blood have been quickly recovered by the injection into the veins of fresh blood from which the fibrine had been removed, leaving only the corpuscles and serum. The red corpuscles of the blood present a combined area of more than 3000 square yards, all of which passes through the lungs every twenty-two seconds. When

the blood corpuscles are greatly reduced in numbers, as in anæmia, the proportion sometimes becoming even less than one third the normal amount, all the life processes of the body are impaired. The red blood corpuscles owe their properties chiefly to hemoglobin, Apples, peas, beans, lentils, and wheat are very rich in iron, and hence excellent foods for persons whose blood is impoverished.

The chief business of the red corpuscles is to carry oxygen from the lungs to the tissues. Oxygen is the most essential to life of all the elements received into the system. The lungs are the organs by which it is taken into the body, and the red blood corpuscles act as carriers to distribute it. Each corpuscle takes on a load of oxygen about twenty times its own size, condensing it so as to make it portable, and this it carries to the capillaries, where the load of oxygen is laid off and a smaller load of carbonic acid taken on, the latter being carried to the lungs and discharged, and a new load of oxygen taken on.

An Interesting Sight.—One of the most interesting of all the many marvelous sights revealed by the microscope, and one of great beauty and interest, is that of the circulation of the blood. The most convenient object for a demonstration of this kind is the tail of a young tadpole. The tissues near the end of the tail are so thin as to be translucent, so that sufficient light will pass through to form an image in the microscope. Almost any thin tissue can be used in the same way, as the web of the hind foot of a frog, the mesentery of a rat, or the ear of a bat. By placing one of these objects under the microscope a most marvelous sight is beheld. One who has once seen it will never forget it. On PLATE VI. will be found an excellent representation of what may be seen with the microscope. We have never watched this wonderful spectacle without feeling impressed anew with the power and wisdom of the great Designer and Creator of all nature. As will be seen by reference to the engraving, the capillaries form a close network of minute canals through which the blood corpuscles course in narrow lines. In the smallest capillaries they follow each other in single file; through the larger ones they pass in twos. In some of the smallest vessels the corpuscles seem to squeeze through with difficulty, being actually larger than the vessels through which they pass, which seeming impossibility they accomplish by changing their form, becoming elliptical, and going through their long way.

Close inspection will bring to notice the fact that the red corpuscles in their passage through the capillaries file along in the center of

the vessel, while the white ones seem to loiter along the walls, stopping here and there a few seconds and then lazily pulling themselves along a short distance farther. If watched closely they may be seen, now and then, to make their way out of the blood-vessels in a curious fashion, by tucking themselves through the minute openings in the capillary walls very much as a ball of putty might, by changing its form, be tucked through a finger-ring. The red corpuscles sometimes accomplish the same feat, though very seldom. The corpuscles which thus leave the blood channels do not find their way back again, but are carried to the heart by means of the lymph channels,—to be next described,—thus being saved and again used so long as they are serviceable.

The capillary circulation has recently been observed in human beings by an eminent physiologist who discovered a means of making visible the capillaries and corpuscles in the lip.

THE LYMPHATICS.

The lymphatic system differs from the circulatory system of blood-vessels in that it has but one set of vessels, all of which run in the same direction, toward the center of the body. The lymphatic system also differs from the arterial and venous systems in that it has few large trunks, being almost wholly made up of minute vessels which constantly communicate with one another in all parts of the body. In certain localities there are found small glandular bodies about which the lymphatic vessels seem to collect, or from which they seem to radiate. These are known as lymphatic glands. They are chiefly found in the vicinity of the groins, the armpits, the neck, beneath the knee, in the bend of the elbow, and among the folds of the small intestine. See Figs. 105, 106, and 107.

Fig. 105. Lymphatic Gland.

The smallest vessels seem to originate in the connective tissue spaces, in all parts of the body. In the mucous membrane of the small intestine they originate in minute protuberances known as *villi*, which will be described hereafter. All the lymph vessels of the lower extrem-

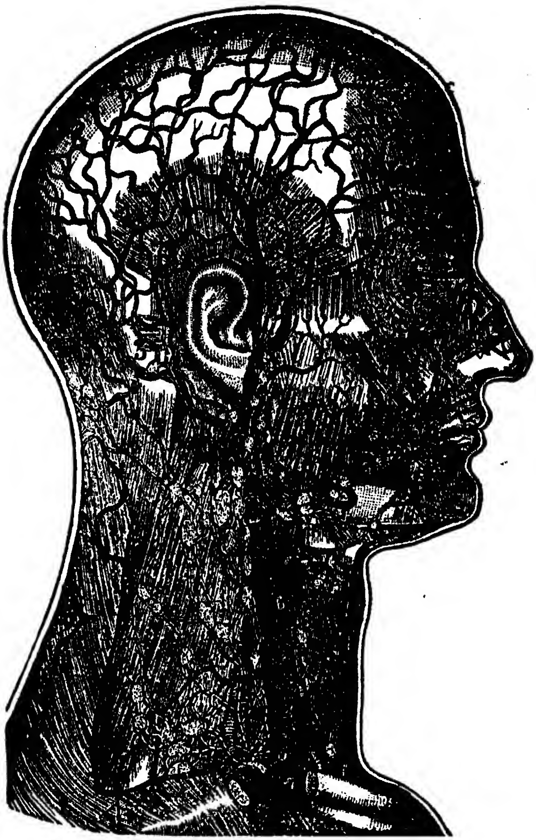


Fig. 106. The Lymphatic Vessels and Glands of the head and neck.

itics, the abdomen, and left half of the upper part of the body, empty their contents, directly and indirectly, into a large duct known as the thoracic duct, which passes up at the back part of the cavity of the abdomen and the thorax and empties into the left subclavian vein. Those of the right half of the upper part of the body are drained by the lymphatic vein, or duct, which empties into the right subclavian vein.

The contents of the lymphatic vessels is a clear, limpid fluid, which, when examined chemically and microscopically, is found to contain a fluid substance similar to the serum of the blood, except that it contains more of the waste or excrementitious elements than the blood. It also contains large numbers of corpuscles called lymph corpuscles,

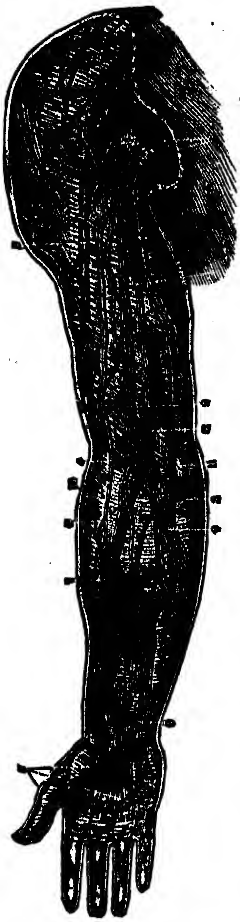


Fig. 107. Shows Lymphatic Vessels of the arm.

Fig. 108. The Lymphatic Vessels showing Valves.

which are similar to, and undoubtedly identical with, the white corpuscles of the blood. The motion of the lymph fluid is toward the center of the circulation, being only in one direction. Like the venous system, the lymph vessels have valves so arranged as to allow of a current in but one direction. These valves are much more numerous in the lymphatics than in veins, as will be seen by reference to Fig. 108. In some lower animal forms, as in frogs, there is a distinct lymph heart which propels the lymph fluid in the vessels. There is no such force in operation in man and higher animals, however, and it is probable that the current of fluid in the lymphatics is chiefly due to the forces which aid the venous circulation; viz., the pressure of fluid from the heart, which is being constantly propelled into the tissues, the contraction of the muscles, acting in conjunction with the valves, and the suction force of the lungs in the act of inspiration.

Functions of the Lymphatics.—As would be readily surmised from the structure of the lymphatic system, its principal function is absorption. From the skin, which is abundantly supplied with lymph vessels, water and many substances in solution may be absorbed, and thus taken into the system. A case is on record in which a boy in a London hospital, suffering with diabetes, absorbed nine pints of fluid through the skin in twenty-four hours. The portion of the lymphatic vessels which are most active in absorption are distributed in the mucous membrane of the intestines, where, as already remarked, special facilities are afforded for the absorption of fluids by means of villi, projections of mucous membrane which float in the fluid to be absorbed. Through these channels—in this

part of the body known as lacteals—much of the food finds its way into the system. Absorption is also going on all through the body. Worn particles and waste products of all the tissues find their way to the heart through the medium of the lymph vessels. It is through these channels, also, that the white blood corpuscles, which, as we have already seen, sometimes escape through the capillary walls, find their way back to the blood-vessels.

It is now known that the lymphatic glands are active in producing white blood corpuscles.

HYGIENE OF THE CIRCULATION.

Although the heart and blood-vessels are the least subject to serious direct injury of any part of the body, the circulatory apparatus is of all parts of the system the most liable to derangement, from sympathy with other parts. No part of the system can become in any way impaired without affecting the circulation, so universal and intimate is the sympathy established by the nervous connections of the heart and blood-vessels.

Exercise Necessary for a Healthy Circulation.—An abundance of muscular exercise is essential for the health of the circulatory apparatus. As already observed, the movements of the muscles in contracting squeeze the blood out of the small veins and press it onward toward the heart. This compels the heart to beat faster in order to dispose of the increased amount of blood which is brought to it, by which means two excellent results are obtained: 1. The impure, venous blood is sent to the lungs,—which in turn act with greater rapidity,—and is there purified and returned to the heart, so that the purity of the blood is increased by the exercise, notwithstanding some waste products from muscular action are added to it; 2. The heart, by beating faster, sends an increased supply of blood not only to the muscles, but to all the organs and tissues of the body; and thus each part is enlivened and invigorated by the increased quantity of fresh, vitalized blood circulating through it. This increased activity of the circulation is not only beneficial to the muscles, nerves, and other tissues of the body, but also to the heart and blood-vessels themselves. The heart is a muscle, and by vigorous contractions it becomes strong, as would any other muscle. The proportionate strength of the heart is well shown by a simple experiment. Let two persons, one who is not accustomed to active mus-

cular exercise, and another who uses his muscles vigorously every day, each count his pulse while standing. Now let both walk briskly or run a few rods, or up and down stairs two or three times. Upon counting the pulse a second time it will usually be found that the pulse of the sedentary person is very much more excited than that of the person accustomed to exercise. This shows that his heart is weaker, and is compelled to make much more violent exertions to accomplish a little extra work than a heart accustomed to demands of that sort. It is for this reason, mainly, that persons unaccustomed to running or walking usually get out of breath so quickly, while one trained in this kind of exercise will endure it with apparent ease for hours. Vigorous exercise, of course avoiding excess, makes strong muscles and a vigorous heart.

Dangers of Excessive Exercise.—While a proper amount of exercise is important and essential to the health of the circulatory system, it should be borne in mind that excess is not only detrimental but dangerous. Violent exertion on the part of one unaccustomed to exercise is often productive of the most serious injury; and even those who have been trained to violent exercises often suffer great detriment. Instances have occurred in which rupture of a blood-vessel has resulted from violent straining in lifting, jumping, or trapeze performances. It is well known that the valves of the heart in professional oarsmen are not infrequently torn loose by the strain induced by rowing. Under violent muscular exertion the pressure of the blood in the arteries is very greatly increased, hence the danger. Violent exercises should always be avoided as in no way beneficial, and always detrimental and dangerous. All the advantages to be gained by exercise can be derived from such moderate exercises as have already been recommended in connection with the subject of the "Hygiene of the Muscles," and will be more fully described in a chapter especially devoted to the subject.

Proper Clothing Essential to Healthy Circulation.—We cannot in this connection consider more of this broad subject of clothing than has an immediate bearing upon the subject in hand, and need not, as we have elsewhere devoted a chapter to its consideration. Undoubtedly the prime object in clothing is to satisfy the demands of modesty; but besides this, the greatest want supplied by artificial covering of the body is the necessity for an equable temperature. This can only be attained by clothing all parts of the body in such a manner as to secure the natural degree of temperature for its several parts, adapting the clothing to the climate and season of the year. Failure to regard this

law is probably more common than the opposite. One-half of the human family, at least, are habitually clad in a manner which totally ignores the requirements of nature in this regard. It is an exceedingly rare occurrence to find a woman who clothes her arms and limbs as nature requires them to be clad for health, at any rate among civilized nations. The women of barbarous tribes and nations are more sensible in this regard, and imitate their husbands and brothers in clothing their limbs as warmly as nature and the exigencies of climate demand. Civilized women not only neglect themselves—we should properly say abuse themselves—in this regard, but their children are allowed to suffer from the same cause. Thousands of these little innocents have been sacrificed to the insatiable Moloch of Fashion.

The extremities, being farthest from the great centers of heat and life, evidently need more clothing than other parts more favorably located; but they commonly receive less. This is an evil, the magnitude of which can scarcely be overestimated. We have no hesitation in venturing the assertion that thin shoes and stockings, and bare arms and legs, kill more children every year than the infamous Herod murdered in Bethlehem. Every philanthropist ought to join earnestly in the work of effecting a reform in this direction. Little reward can be expected, however, for this kind of work in the present generation. The results would be best seen in the next, in the effective labors of thousands whose lives are now made useless by disease, the foundation of which was laid in early childhood by the evil practice in question, and of thousands of others who to-day are filling tiny graves which ought to have remained vacant for at least threescore years. Every mother who becomes enlightened on this subject ought to communicate the knowledge she has gained to the mothers in the circle of her acquaintance. By this means, together with the influence of example, we might hope for good results. There has been recently organized in New York City a society, the stated object of which is the prevention of cruelty to children. We would most earnestly commend to their attention this question of proper clothing, and we doubt not that the amount of good they might do by propagating correct principles on this subject would far exceed the good results in all other departments of their work.

Evil Effects of Constriction.—Constriction of any part of the body is certain to be followed by evil consequences. Suppose, for example, a string be tied tightly around the finger. Every one is familiar with the fact that the finger thus ligated will speedily lose its

natural color, become dark and as quickly lose its natural warmth, becoming cold, and that notwithstanding its swollen condition due to the superabundance of blood. An elastic around a limb will have precisely the same effect upon the foot, though in less degree. The circulation being obstructed, less blood than is necessary to health flows through the foot, and it is habitually cold; and from the constant interference with its nutrition, it becomes shrunken and weak. The use of elastics is well known to be a cause of thin calves.

A constriction about the waist, from compressing the stomach, liver, and other internal organs, must do an immense amount of harm to the body by interfering with the functions of these important organs. It makes no difference whether the constriction is due to a tightly drawn corset or to the bands of skirts hung upon the hips, or to a belt tightly clasped; the effect is the same. An English medical journal is authority for the statement that in that country quite a large proportion of women upon whom *post-mortem* examinations are held are found to have their livers malformed from compression due to this very cause. We have seen cases in which the liver was cut nearly in two, and cases are reported in which the liver had actually been divided by this cruel process. By the interference with the circulation in abdominal organs, piles or hemorrhoids is induced, with painful local disorders peculiar to females.

Constriction of the throat is an evil not now so common as in former days when the old-fashioned cravat was worn; but occasionally care is not taken to secure the degree of freedom about the neck which is essential to health. It requires but a very slight constriction of the neck to interfere with the circulation of the head sufficiently to occasion very unpleasant and even serious symptoms, such as headache, dullness, and vertigo; even apoplexy may be induced in this way.

Effects of Food on the Circulation.—As the blood is made of what we eat, it is evidently of the greatest consequence that what is taken into the stomach for the purpose of making blood should be of the very best material. Poor food will make poor blood, which will, in turn, make all the tissues of poor quality. Certain kinds of food, as what is termed rich food, or that which contains too much sugar, fats of various sorts, and condiments, deteriorate the blood, both directly and indirectly,— directly, by filling it with useless or superabundant material; indirectly, by rendering the liver sluggish and in

efficient, thus occasioning an increase in the elements which ought to be removed as bile. Other foods damage the blood by filling it with material which is not only directly injurious to the blood itself, but to all the tissues with which it comes in contact, whether in finding their way into the blood through the stomach or out of it through the liver, kidneys, skin, bowels, and other eliminating organs. Of this character are most condiments, as will be shown in treating of the subject of "Food and Diet," as well as in connection with "The Hygiene of Digestion," to which we would invite the further attention of the reader.

Narcotics and stimulants must not be overlooked in this connection, for their influence for evil upon the heart and the circulation is too great and too well determined to allow of the possibility of doubt, or the need of waiting for further evidence. Alcohol, tobacco, hashish, opium, absinthe, even tea and coffee, must be included in the category of harmful agents of this class. The manner in which each of these agents operates in effecting its evil work must be left for special consideration in a chapter devoted to the subject.

Injurious Effects of Cold.—Cold paralyzes the heart, and to its depressing influence is due the fact that so large a proportion of aged persons die in the cold season of the year. Having lost in some degree their power to produce animal heat, they quickly succumb to the exposures incident to the inclement season of the year. Hence it is important that the old, of all others, should be warmly clad in winter. There are current many incorrect notions respecting the means of protection from the injurious influence of cold. The idea that stimulants will enable a person to withstand cold has been long exploded. The uniform testimony of physiologists and Arctic explorers is to the very reverse. Physiologists find by actual experiment, testing the temperature of a person both before and after the imbibition of spirits, that the temperature is uniformly lowered by alcohol in all forms. Arctic navigators say that for a man to take alcohol when traveling amid the snow and ice of the frozen regions of the North, where the temperature is often 70° F below zero, is almost certain death. Alcohol makes a man feel warmer, but really abstracts heat from him. So with tobacco, which many persons habitually smoke, in the winter to make them warm and in the summer to keep them cool. It depresses the action of the heart, and consequently diminishes the amount of heat

produced. The best means of protection are those which will raise the vital tone, strengthen the force of the circulation, and thus increase the manufacture of heat, while proper means are taken to preserve and economize that which is produced. Cool bathing for the robust is a splendid method of augmenting animal heat. The use of the oil-bath is an excellent means of protection from cold. A gentleman who was able to speak from experience said very truthfully that an inunction was as good as an extra overcoat.

Many persons make the great mistake at the beginning of cold weather of shutting themselves up indoors with hot stoves or furnaces, confining themselves to avoid taking cold. This is the most certain way to prepare one's self to acquire a cold upon the slightest provocation. A person may become so tender and susceptible by following such a plan that simply opening the window for a breath of fresh air, stepping to the door to admit a friend, or the most trivial degree of exposure will be sufficient to bring upon him the most severe effects of "taking cold." All persons, particularly those who are specially sensitive to cold, even invalids, should, at the beginning of winter, begin to accustom themselves to cold. Thus by degrees their susceptibility may be overcome in a very large measure, if not wholly. Daily exercise in the open air, and a daily bath with friction of the skin and inunctions, with plenty of good food and abundance of sleep are also important means of fortifying the system against the ravages of cold.

Evil Effects of Heat.—Excessive heat has a still more disastrous effect upon the circulation than cold, as is evidenced by the large number of cases of sudden death which annually occur from "sunstroke" and "heat-stroke." That this malady is really due to heat and not to the influence of the sun, as many suppose, is evidenced by the fact that many cases occur among factory operatives, furnace men, stokers in ships, and other persons whose occupation is wholly indoors. The remedies for this affection are given in the proper place. As it is often fatal, its prevention is of equal importance with its cure. Those who have had the most extensive experience with this disease assert that those who suffer from it are, as a general thing, persons who are in a debilitated condition from overwork, loss of sleep, dissipation, the use of alcohol, or poor and insufficient food. Stimulants are especially conducive to the disease. All these predisposing causes should, of course, be avoided, as well as the exciting cause already indicated. Persons who are exposed to excessive heat in the summer season should take care to

keep the head cool, which may be accomplished by means of a cloth wet in water and worn inside the hat, by very frequent wetting of the head, by the use of umbrellas in the sun, and by other means which special circumstances may require or suggest. Fig. 109 illustrates a mode of keeping the back part of the head cool in hot weather, which may be adopted with advantage by those whose occupation obliges them to be much exposed to the sun.

Fig. 109. A means of protecting the back of the head and neck from exposure to the sun.

The habit of frequently applying ice or ice-cold water to the head in hot weather is likely to be productive of injury. The head is cooled for the moment, but a reaction soon takes place, and then there is a greater determination of blood to the head than ever. It is best to employ for bathing the head, water which is only moderately cool, and then depend on the evaporation to produce the necessary cooling effect. Ice and iced-water should be used only in cases requiring sudden and extreme cooling of the head, and then should be continuously applied until the desired effect is obtained.

The natives of Africa protect themselves from the intense heat of the tropical sun to which they are exposed by smearing their bodies with *ghee*, a kind of ointment. It is difficult to see what benefit can be derived from such a proceeding, but it is possible that the smooth, oiled surface of the skin may reflect the solar rays of heat and thus protect the body from their influence, at least to some extent.

THE RESPIRATORY APPARATUS.

The respiratory apparatus consists of the air-passages, the lungs, and the thorax, each of which will be briefly described.

The Air-Passages.—These consist first of the mouth, the nose, the *pharynx,* or back part of the mouth, the *trachea,* or windpipe, the upper part of which is also called the *larynx,* and the *bronchial tubes.* The mouth needs no precise description. The nose or nasal cavity consists of a hollow left between the bones of the face and those of the skull, which is divided into two parts by a bony and cartilaginous septum, each compartment communicating separately externally through the *anterior nares,* or nostrils, and with the back part of the mouth through the *posterior nares.*

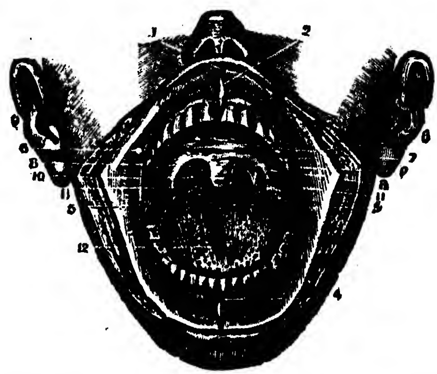


Fig. 110. The Pharynx, shown by slitting the cheeks at the corners of the mouth; 6. Mouth of duct from the parotid gland; 7. Roof of mouth; 8. Posterior nares; 9. Fauces; 10. Uvula; 11. Tonsils; 12. Tongue.

The *trachea,* or windpipe, is a flexible open tube situated just in front of the meat pipe, or gullet, and is composed chiefly of rings of cartilage connected together by membrane. These rings are not quite complete at the back side, the space being filled by muscular tissue.

The *larynx* is the upper part of the trachea, and consists of a cartilaginous box across which are stretched four delicate ligaments, the *vocal cords,* the upper two being the *false,* and the lower the *true* vocal cords, which are concerned in the production of the voice.

6

Fig. 111. The Larynx. 6. Thyroid Gland.

The top of the larnyx is guarded by a cartilage, the *epiglottis*, which is shaped somewhat like a leaf, and has a hinge-like attachment to the upper end of the windpipe, so that when the tongue is drawn back, as in swallowing, it will fit down upon the larynx like a cover, and completely close it. By this wonderful provision of nature, both solids and liquids are prevented from entering the trachea while eating or drinking. A patient in Bellevue Hospital, New York, whose epiglottis had been destroyed by disease, had great difficulty in swallowing on account of the frequent entrance of particles of food into the trachea, causing violent coughing. The cartilages of the larynx form the prominence in the throat just below the chin, which moves up and down in swallowing, and is popularly known as Adam's apple.

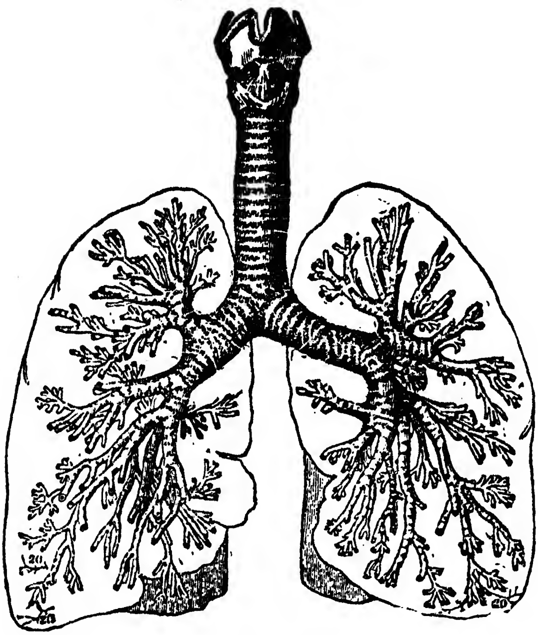


Fig. 112. The Air-Passages.

The *bronchial tubes* are simply continuations of the trachea, which divides into two branches in the chest, one of which enters each lung and there subdivides until the tubes become not more than $\frac{1}{120}$ of an inch in diameter, when they terminate in the air-cells. After the bronchial tubes become so small as $\frac{1}{60}$ of an inch, the cartilage disappears from their walls, so that the small bronchial tubes, or bronchioles, have membranous and muscular walls.

The air-passages are lined throughout with mucous membrane. The epithelium of the windpipe and bronchial tubes is very peculiar, consisting of cone-shaped cells, the large ends of which are covered with delicate hairs. These are kept in constant motion, always waving in the same direction, by which means there is maintained a con-

stant current of mucus in the direction of the mouth. The evident purpose of this arrangement is the protection of the lungs from dust, which will be caught in the stream of mucus and carried to the mouth for expulsion.

The relative position of the several portions of the air-passages is well shown in Fig. 112.

The Lungs. — The real structure of the lungs is seen only by examination with a powerful microscope, which shows the pulmonary tissue to be made up almost wholly of small cells and minute capillary blood-vessels, together with the small bronchial tubes. These several elements are somewhat loosely held together by bands of yellow elastic tissue, of which a great share of the lung substance is composed. The cells are arranged in groups of fifteen or twenty, which are called lobules. Each lobule is attached to the end of a bronchiole with which it communicates. Fig. 113 shows two of the lobules with the end of the small bronchial tube with which they are connected. The number of cells in the lungs has been calculated to be not less than seventeen hundred million (1,700,000,000).

Fig. 113. Lobules of Lung, showing at *a* end of bronchial tubes, and at *c c* air cells.

The lung cells as well as the air-passages are lined with a membrane which is so very thin that twenty-five hundred layers would be required to make an inch in thickness. The extent of this membrane is very great, owing to the great number of the cells. It has been estimated that if spread out, its area would be not less than two thousand square feet. Underneath this thin membrane is spread out in the walls of the cells, the closest network of capillaries in the body. So small are they that only a single blood corpuscle can pass through at once, and so near are they placed together that they occupy fully three-fourths of the entire surface, great as it is. Through these minute channels pass over fifteen barrels of blood every twenty-four hours.

The lungs occupy the two sides of the chest, the cavity of which they nearly fill. The right lung is divided by two deep fissures into three portions, called lobes. The left lung consists of two lobes. Both lungs are covered over with a delicate serous nembrane, the *pleura*, which also lines the chest walls.

The *thorax* is the upper of the two cavities into which the trunk of the body is divided, being separated from the abdomen by the diaphragm, a muscular organ which has been already described. It is made up of its bony framework—the ribs, vertebræ, and sternum—and the muscles which lie between the ribs and about the upper part of the chest. It is lined by the same membrane which covers the lungs, the pleura. The lungs lie in immediate contact with its inner walls, but are perfectly free from attachment to it. The thorax contains, in addition to the lungs, the heart and the great blood-vessels, together with important nerves. Connected with the thorax and accessory organs of respiration are several sets of muscles which aid in expanding and contracting the cavity of the thorax.

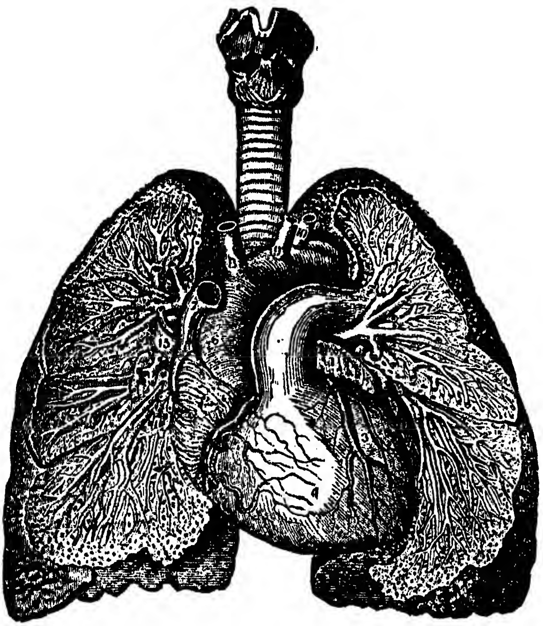


Fig. 114. Cut showing the relation of the Lungs and Heart.

PHYSIOLOGY OF RESPIRATION.

The lungs are the means by which the system receives gaseous food. It is received all ready for use by the system, no elaborate preparation being required as in the case of solid food taken by means of the stomach. Of the three kinds of food received by the body, solid, liquid, and gaseous, air is by far the most immediately essential to life. A person may live many days without solid food, and several days with neither solid nor liquid aliment; but death occurs in a few minutes when the supply of air is cut off, as in suffocation or drowning, a fact which indicates with sufficient clearness the importance of the subject.

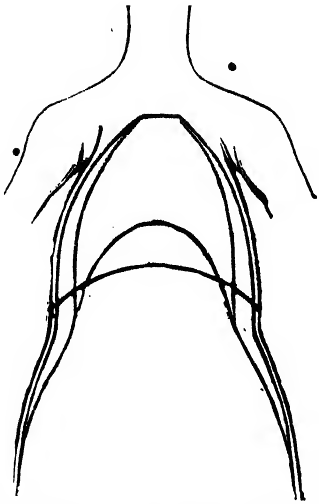


Fig. 115. Cut showing how the capacity of the chest is enlarged by expansion of its walls and depression of the diaphragm.

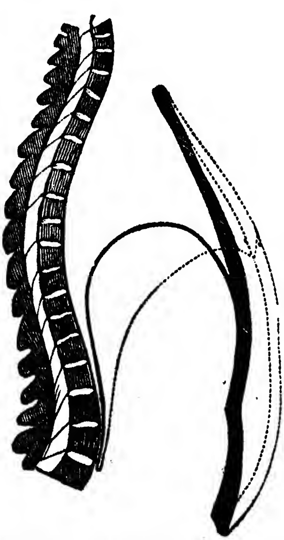


Fig. 116. A lateral view illustrating the same as Fig. 115.

Movements of Respiration.— The acts of respiration are two,—inspiration and expiration. These two acts are performed by changes in the size of the thorax. In producing inspiration, the thorax is made larger, by depression of the diaphragm, which elongates the chest cavity, and elevation of the ribs, which enlarges the chest laterally. In consequence of the increased space in the thorax, the air simply rushes in to occupy the room made for it. It should be noticed in this connection that the air does not force its way in, but simply enters when invited by room being made for it. In expiration, the opposite takes place. The ribs are lowered, and the diaphragm, being relaxed, is pressed upward into the chest by the contraction of the abdominal muscles. The natural elasticity of the lungs also aids in expiration, as they are forcibly distended during inspiration, and naturally tend to return to their normal state, which is undistended, as at birth. There are said to be three kinds of respiration, according to the portion of the lungs which is most active. When the breathing is performed mostly by the diaphragm, it is termed *abdominal* respiration; when the lower portion of the ribs is used, *inferior costal;* and when the upper part of the chest is employed, *superior costal.* The last-named is the most common respiration in women, which is said to be natural for them, but which, in our opinion, is due to the fact that by their mode of dress the lungs are usually confined so that only the diaphragm and upper ribs can operate freely, the

chest being effectually hindered from lateral expansion by the employment of tight-lacing with or without the use of corsets. For change in size and appearance of chest during respiration, see Figs. 115, 116, 117, 118.

Frequency of Respiration. — The general law of respiration requires one respiratory act for every four heart-beats. As the pulse is seventy-two to eighty per minute in the adult, respiration is from eighteen to twenty during the same time. The frequency of respiration is increased and diminished by the same causes which affect the pulse rate. It is notably increased by exercise, heat, and stimulants, and diminished by sleep and by cold. During the hibernation of animals, respiration is so slight and infrequent as to be almost imperceptible, the pulse being diminished proportionately.

Coughing, Sneezing, Laughing, and Other Modifications of Respiration. — Most of these modifications of the respiratory act are more or less involuntary, though to some degree controllable by the will. *Coughing* and *sneezing* consist of a prolonged inspiration followed by a forcible exhalation, produced by a convulsive expiratory effort, the air, in coughing, being expelled wholly through the mouth, in sneezing by both mouth and nose, though chiefly by the mouth, contrary to the usual opinion. *Sighing* is a deep and prolonged inspiration, followed by a rapid and audible expiration. A slight sigh naturally occurs every seventh or eighth respiration, by which a more complete change of air in the lungs is effected than in ordinary breathing. *Yawning* is similar to sighing, except that the mouth is widely opened during inspiration, and that it is involuntary. It is a curious fact that yawning is contagious in a remarkable degree. A person who is able to imitate yawning well may by adroit management set a whole company of people yawning. *Laughing* and *sobbing* differ more in the character of the emotions which they accompany than in the mode of production. Both acts result from short and convulsive movements of the diaphragm, accompanied by contraction of the muscles of expression. *Hiccough* is a modification of inspiration, being due to sudden contraction of the diaphragm. It is usually indicative of derangement of digestion, being often caused by rapid eating and by the use of effervescing drinks.

Capacity of the Lungs. — The cubic contents of a pair of well developed lungs is about three hundred and twenty cubic inches. Of

this quantity but a small part is used in ordinary respiration, not more than twenty cubic inches. It is possible, however, after making an ordinary expiration of twenty cubic inches, by a strong effort to force out one hundred cubic inches more. It is also possible after an ordinary inspiration to inhale, by a strong effort, one hundred cubic inches extra. Thus after a forcible inhalation a person may expel from the lungs two hundred and twenty cubic inches of air; but there always remain one hundred cubic inches of air in the lungs which cannot be expelled. The object of this great surplus of breathing capacity is to provide for contingencies of various sorts which are continually arising, and which make demands for an increased quantity of air. It is to this that is due the fact that persons may even live for years after one lung has become entirely useless, examples of which we have several times met in our own practice. The comparative capacity of the lungs after inspiration and after expiration is well shown in Figs. 117 and 118.

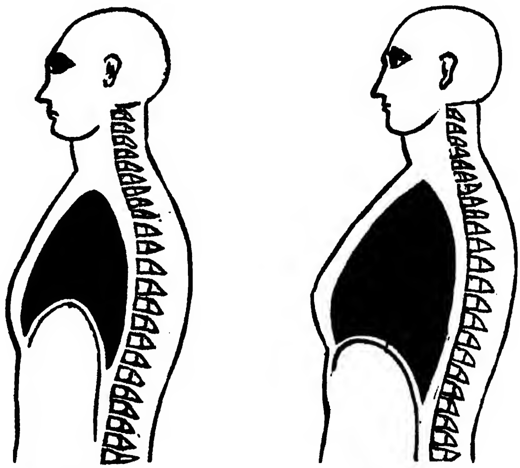


Fig. 117. Fig. 118.

FIG. 117. Relative capacity of the Chest and position of the Diaphragm after a complete Expiration.

FIG. 118. Relative capacity of the Chest and position of the Diaphragm after a full Inspiration.

Vital Capacity.—The amount of air that can be changed at one respiration is called the *vital capacity* of an individual. Dr. Hutchinson has shown that vital capacity depends much upon the height, and increases regularly at the rate of eight cubic inches for every inch of increase in height between five and six feet, being about one hundred and seventy-five cubic inches for a person five feet in height, and about two hundred and fifty-five cubic inches in persons six feet in height. The vital capacity can be greatly increased by proper training, as we have often demonstrated in the treatment of consumptive patients.

Composition of the Air.—The air we breathe is a simple mixture of numerous gases, the chief of which are oxygen and nitrogen, the former constituting about one-fifth, and the latter four-fifths of the whole, the other gases being so minute in quantity that they need not be taken into account, with the exception of carbonic acid, or more properly carbon di-oxide, and watery vapor. Of the former the air contains about four parts in ten thousand; and of the latter a variable quantity. That is, in one hundred cubic inches of air there are about twenty cubic inches of oxygen (20.89), and about eighty cubic inches of nitrogen (79.11); and in ten thousand cubic inches of air there are four of carbon di-oxide. There has recently been discovered a new element, Argon, which exists in the air in the proportion of about one part to 200. Argon is said to be the most inert of all elements. Whether or not it has any relation to life and health is not known. Besides these the air contains slight quantities of the various gases given off in animal and vegetable decomposition.

For animals, and, in fact, according to recent discoveries, for all living forms, vegetable as well as animal, the oxygen of the air is the essential element. Life is dependent upon its regular and adequate supply more than upon any other element.

The nitrogen of the air is only useful to dilute the oxygen, as in an atmosphere of pure oxygen we should live so fast as to be very short-lived. Experiments with animals show that prolonged inhalation of air in which the proportion of oxygen is much different from that in which it naturally occurs in the atmosphere, produces great disturbance of the system and finally death, from which it appears that the mixture which we call air is not an accidental compound, but one admirably adapted to the wants of human beings as well as lower animals and even plants.

The carbonic acid in the air is the result of animal and vegetable decomposition, combustion, and the respiration of plants and animals. It is not necessary to human life, but is essential to the life of plants, of which it constitutes one of the principal forms of food, another admirable adaptation of nature by which what is poisonous to one part of the animate creation is essential to the existence of the other. Plants require carbonic acid, or carbon di-oxide, as food, yet they respire oxygen, as do animals. All living things are thus dependent upon this important element.

The watery vapor of the air is necessary to enable the lungs to

utilize the oxygen readily, it being found by experiments that dry oxygen is absorbed much less rapidly than that which contains a due proportion of moisture.

Changes in the Air During Respiration.—Upon examining the air which is exhaled from the lungs it is found that while passing through these organs it undergoes certain changes, both losing and gaining certain elements. The air taken into the lungs in an ordinary respiration—

Loses about one cubic inch of *Oxygen.*
Gains about one cubic inch of *Carbonic Acid Gas.*
Gains about one cubic inch of *Watery Vapor.*
Gains about one cubic inch of *Organic Matter.*

During forced respiration, when a larger quantity of air is inhaled, the quantity of oxygen lost in the lungs and the amount of carbonic acid gained are of course greater, which is also true of the other changes mentioned. It should be remarked that the amount of carbonic acid gained is a little less than that of the oxygen lost.

Changes in the Blood in Respiration.—The changes which occur in the blood while passing through the capillaries of the lungs are equally marked. When the blood enters the lungs from the pulmonary artery, which brings it from the right heart, it is of a dark purple color, its color being due to the impurities which it contains, the chief of which is carbonic acid. When the blood leaves the lungs, it is of a bright red color, having exchanged its carbonic acid for oxygen, which is absorbed by the red corpuscles to be conveyed to every part of the system, being assimilated in the capillaries of the tissues and changed to carbonic acid, which is brought back to the lungs in the venous blood. Other impurities are also given out in the lungs, constituting the organic matter of the expired air. The blood also loses a little of its water in passing through the lungs, and is slightly cooled. The last mentioned fact completely refutes the old theory of an eminent chemist, which is still believed by some, that the lungs are a sort of furnace in which the carbon of the blood is consumed as coal or wood is consumed in a stove, since if the theory in question were true, the blood would gain heat in the lungs instead of losing.

The blood and air are brought into such close contact in the lungs, being only separated by the delicate membrane already described, which is not more than $\frac{1}{2500}$ of an inch in thickness, that the change

of gases takes place with the greatest facility. Indeed, it is believed that the membrane lining the air-cells facilitates, rather than hinders, the escape of the carbonic acid in the lungs and the absorption of oxygen. When it is considered that nearly five hundred gallons of blood are thus purified every day (the same blood being purified over many times), for which more than eighty barrels of air are required, it is readily seen that there is abundant necessity for the two thousand square feet of membrane devoted to this purpose in the lungs.

By this process of indirect combustion, in many respects analogous to the burning of coal on a grate or of wood in a stove, or the burning of a candle or a gas jet, more than half a pound of solid carbon is daily consumed in the body. In persons whose occupation is very laborious, more than three-quarters of a pound is thus daily consumed.

The amount of carbonic acid exhaled is modified by several other influences besides exercise, as age, sex, diet, etc. The largest amount is exhaled during the prime of life, gradually increasing from infancy to that period, and declining during advancing age. Females exhale some less than males. Much more is produced during digestion than at other times, the amount being particularly increased by certain articles of food, as sugar and animal food, and especially by stimulants, wine, rum, beer, ale, cider, and even tea and coffee, a fact which completely refutes the argument made in favor of the last-named articles, that they diminish the waste of tissue, since it is evident that they increase it. These facts were chiefly established by the experiments of the late Dr. Edward Smith, of England. During sleep the amount of carbonic acid exhaled is greatly diminished. In the winter sleep of some hibernating animals it is reduced to less than $\frac{1}{80}$ of the ordinary amount. Violent exercise may increase the quantity of carbonic acid exhaled to six times the ordinary amount. In a dry atmosphere the mucous membrane of the lungs becomes dry, and thus loses in a considerable degree its power to transmit gases, so that the amount of carbonic acid is greatly diminished while breathing it.

Respiration of the Skin.—The lungs are not the only respiratory organs. The skin also participates in the process, though it does but a small amount compared with the lungs, the proportion being not more than one to forty. In some lower animals, as in the frog, a much larger amount of respiratory work is done by the skin.

HYGIENE OF RESPIRATION.

Under this head we shall dwell specially on such portions of the subject as pertain particularly to the lungs, leaving the hygiene of the air and the subject of ventilation for more complete and explicit consideration in a separate chapter.

Lung Exercise.—No part of the body is susceptible to greater improvement from systematic exercise, or suffers greater detriment from neglect of exercise. When the lungs are not well expanded habitually, they gradually lose, to some degree, their elasticity, so that the power to expand them is lost. In the physical examination of hundreds of chests we have had occasion to notice, in scores of instances, the almost total loss of power to expand the chest. If asked to do so, the patient would shrug his shoulders, perhaps elevate them as high as possible, and make a desperate attempt to get a little more air than usual into his lungs, accomplishing but very little in that direction, however, as the tape-line placed about the chest showed no appreciable increase in size. We have often found persons in this condition, whose chests ought to have measured two to four inches more when filled than after inspiration.

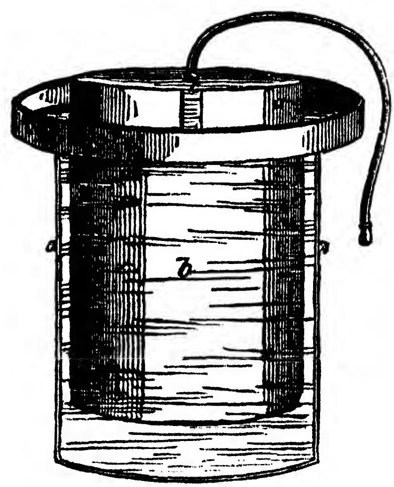


Fig. 119. Spirometer. *a.* Inner vessel, with which the inhaling tube communicates; *b.* Outer vessel containing water; *c.* Scale indicating the number of cubic inches inhaled.

The Spirometer.—The use of the spirometer is an excellent means of noting the change which can be made in the vital capacity of the lungs by systematic exercise persevered in daily for months. This instrument is shown in Fig. 119. As it is very simple, it can be made by any tinsmith at an expense of a few shillings. The instrument consists of two tin vessels, one inverted inside the other. The larger one should be nearly filled with water, and should have a small tube passing up through the center nearly to the top. This should communicate with a flexible tube outside, to the end of which is at-

tached a mouth-piece which may consist of a short glass tube with a good-sized bore. By blowing into the tube the inner vessel will be made to rise, and the amount of air expelled will be indicated by a scale accurately determined by previous calculation or experiment, and marked on the outside. If the inner vessel is eight inches in diameter, a scale may be made with lines one-tenth of an inch apart, each of which will represent five cubic inches of air. A person five feet high ought to be able to raise the scale three inches and a half after taking a full inspiration. A person six feet high should be able to raise it five inches.

By the daily practice of lung gymnastics as described in the chapter on exercises, a person may increase his vital capacity from a few inches to many times as much.

When a person is weary, and feels exhausted from sedentary employment, the practice of deep and prolonged respiration with the chest well expanded, the shoulders back, and the spine erect, will be exceedingly refreshing.

The great advantage of abundance of lung exercise is well seen in the fact that professional singers suffer less from pulmonary difficulties than others. A medical professor of St. Petersburg recently examined the chests of more than two hundred professional singers in that city, and found their chests better developed than those of the majority of persons, and an almost entire absence of lung diseases.

Corset Choking.—Choking is keeping air out of the lungs; at least, that is a practical definition of the word. It makes no difference to the lungs and no difference to the blood, whether the life-giving oxygen is kept out by confining the respiratory apparatus at its lower or its upper part. The result is precisely the same in either case. A man who ties a rope around his neck and kills himself by choking is called a suicide. A young lady who does essentially the same thing by lacing her waist, only taking a little longer time for it, is considered extremely fashionable. Pure air is the first and the last desideratum of human life. Independent life begins with the first breath, and ends with the last act of respiration. A human being lives in proportion as he breathes. Frogs and lizards are sluggish because they breathe little. Birds are more vigorous in their movements because of the wondrous capacity and activity of their lungs. So with human beings. Need we suggest that those feeble-minded creatures who emulate each other in compression of the waist, thus curtailing the breathing power, are like frogs and lizards

in their capacity for appreciating the "joy of living"? or that their organs of cerebration may be as diminutive as their waists?

The evils of corset-wearing have already been dwelt upon quite fully, and we will not recapitulate here; but we wish to call special attention to three ways in which the use of corsets, whether worn extremely tight or not, acts injuriously upon the lungs and respiration.

1. By compression, the muscles of respiration lose their power to act, and waste away, so that strong, deep respirations become impossible. This is the reason why ladies feel, when deprived of their corsets, as though they would "fall all in pieces."

2. By confinement in a stiff, unyielding case, the elastic cartilages which unite the ends of the ribs to the breast-bone so as to give freedom of action, become rigid, and thus prevent full expansion of the chest and filling of the lungs.

3. By compression of the lower part of the lung the upper part is crowded up against the inner border of the first rib, against which it is continually pressed, so that the constant motion and friction finally excite irritation which undoubtedly becomes the starting-point of many cases of consumption.

Poisonous Character of Air Which Has Been Breathed.—As already shown, air which has been breathed contains a large proportion of carbonic acid, and besides this a poison much more deadly in its character, organic matter, the exact nature of which chemists have never yet been able to determine. The carbonic acid is not itself greatly injurious in the quantities in which it is produced by breathing, but as it is always in about the same proportion to the organic matter, it is a reliable index to the amount of the latter poison, and so to the character of the air. It is the organic matter referred to which gives to close rooms the peculiar *fusty* odor with which every one is familiar. Persons who are confined in-doors most of the time become so accustomed to this warning of danger that they do not appreciate it, and hence do not heed it; but when a person who has been some time in the open air comes into a poorly ventilated room occupied by several persons, the odor is very perceptible, and the first impulse is to open the doors and windows and let the foul air out and pure air in, though the persons in the room may be wholly unconscious of the condition of things. This foul and pernicious poison is closely associated with the watery vapor of the expired air. In cold weather this vapor condenses upon the window-panes, and may be collected. The fluid thus collected forms a most fetid

and disgusting mass after standing in an uncorked bottle for a few days.

The experiments and researches of eminent scientists on the nature and effects of this poison as it exists in respired air, seem to show quite conclusively that it is the principal cause of the numerous evil effects of breathing air which has been previously respired.

Rapidity with which the Air is Contaminated by Breathing.—Experiments have shown that air which has been breathed over a few times contains ten per cent of carbonic acid, and of course a correspondingly large proportion of the organic poison, which is an increase from four parts in ten thousand of air, to one thousand parts in the same amount of air. According to the results which have been obtained by Parkes, Cameron, and numerous other investigators in this line of sanitary science, a single breath, containing a cubic inch of carbon di-oxide, renders unfit for respiration three cubic feet of air. It may be easily calculated from this, with the fact that we usually respire twenty times a minute, how long the air in a seven-by-nine bedroom may be made to last. Supposing such a room to be eight feet high and tightly closed, with one occupant in it, the air would remain fit to breathe less than ten minutes! If bedrooms were air-tight, thousands more would have died from neglect or ignorance of this fact than have already filled premature graves in consequence. Fortunately for the human race, at least for the civilized part of it, our houses are seldom air-tight. A little air will find its way in, even through brick walls. Nature has provided us with an ample abundance of the greatest necessary of life, making it free to all,—for no despot ever put a tax upon the air his subjects breathed,—and even urging us to accept whether we desire it or not.

The Effects of Breathing Impure Air.—Without going into details these may be briefly summed up to be headache, dullness, nervousness, debility, consumption, and an aggravation of all other maladies. The headache of which school-children suffer so much is chiefly due to foul air. Consumption is well known to be most frequent in those whose habits or vocations are chiefly sedentary, or which keep them in a foul atmosphere.

Experience in the late war showed that impure air was an important cause of rendering diseases fatal which otherwise would have been far less serious. At the first Sanitary Convention in this country, held at Detroit, Jan. 7 and 8, 1880, under the auspices of the State Board of Health of Michigan, in the discussion of a paper on ventilation, an old army surgeon who had charge of large hospitals during the war, related a very

interesting experience illustrating the importance of securing to the sick, and especially to persons suffering with fever, an abundance of pure air. He stated that during the war he had charge of a large hospital in which at one time in the winter season he had under treatment three hundred and twenty cases of measles. Just at this time the hospital took fire and burned to the ground. The patients were placed in tents, and all but one or two recovered. He had no doubt that the number of deaths would have been thirty or forty, at least, had the patients remained in the hospital. He afterward sent one hundred men who were only slightly ill to the general hospital at Nashville, and seventy-five of them died. Upon visiting the hospital, he found it so poorly ventilated that the air was exceedingly foul, producing a sickening sensation when he had only been in it for a few minutes. The Doctor concluded by remarking that he regarded pure air and water as most important agents, and believed them to be capable of controlling the ravages of infectious disease.

The best methods of securing an abundance of pure air by ventilation, the amount necessary for each individual, and other questions of importance pertaining to this subject, are considered in another chapter.

Dust and Germs.—The greatest danger to which we are exposed through the air is the inhalation of disease germs, which exist in the air in the form of microscopic dust. The poetic "motes" which "dance in the sunbeams" are in large part made up of deadly germs either in masses or adhering to particles of wood, cotton, and other substances which are so light as to float in the air. Street dust contains a great variety of germs. Consumption, diphtheria, pneumonia, and many other maladies owe their origin chiefly to the inhalation of germs which are carried about in the air as dust. The consumptive spits upon the ground; the expectorated matter contains multitudes of microbes, every one of which, under favorable conditions, is capable of developing in the tissues and setting up the disease. The sputum thus carelessly disposed of becomes dry, is ground into dust, and whirled into the air by some passing breeze, to be inhaled by other persons, who thereby contract the disease. In the house, dust accumulates under the carpet, upon window sills, on book-cases, upon drapery, wherever there is opportunity for lodgment, only waiting to be set afloat again by the broom or dust brush of the housemaid. To be healthful, a house must be kept free from dust. When sweeping, some method should be adopted to avoid setting the dust afloat, as by sprinkling the floor, moistening the broom, or scattering salt or some other material upon the floor.

THE DIGESTIVE APPARATUS.

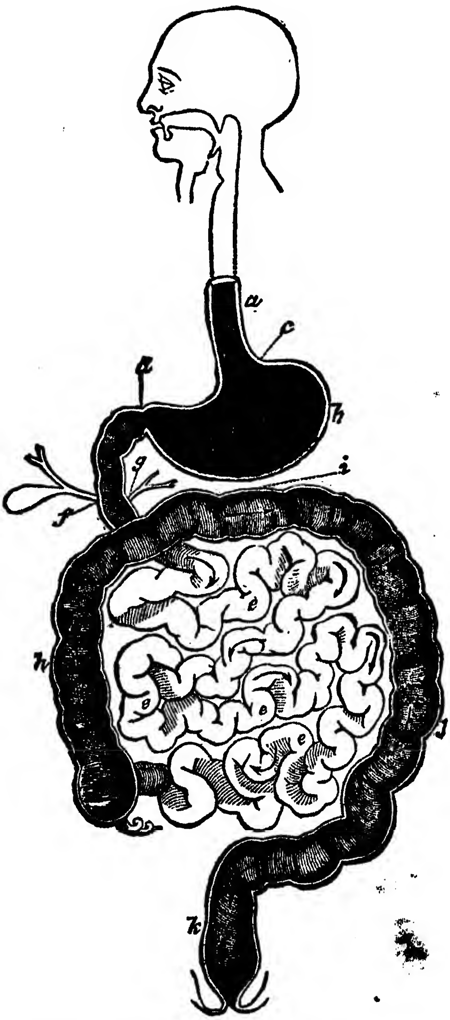


Fig. 120. The Alimentary Canal. *a.* Œsophagus; *b.* Stomach; *c.* Cardiac Orifice; *d.* Pylorus; *e.* Small Intestine; *f.* Bile Duct; *g.* Pancreatic Duct; *h.* Ascending Colon; *i.* Transverse Colon; *j.* Descending Colon; *k.* Rectum.

The Alimentary Canal.—Fig. 120. The digestive apparatus consists of a long, tortuous tube, the *digestive* or *alimentary canal,* to which are appended various accessory organs.

The alimentary canal is about thirty feet in length, and is lined throughout with mucous membrane, which is variously modified, according to its location. Each end of the canal is guarded by a circular muscle, the upper opening, the mouth, being by this means opened or closed at pleasure, while the lower is involuntary in its action, only opening when overcome by force applied from above, a wise provision of nature to antagonize the influence of gravitation upon the contents of the bowels, and to retain the same during sleep or other periods of unconsciousness. This canal, which at an early period of development in human beings—as permanently in some simple animal forms—is merely a straight tube, in the fully developed individual becomes so modified as to present at least five distinct portions, each of which possesses peculiar and important functions, and

hence requires separate description, together with the several accessory organs which are connected with them. Although a more detailed classification is possible, for our purpose it will be sufficient to consider the alimentary tube as divided into the *mouth, œsophagus, stomach, small intestine,* and *large intestine,* or *colon.*

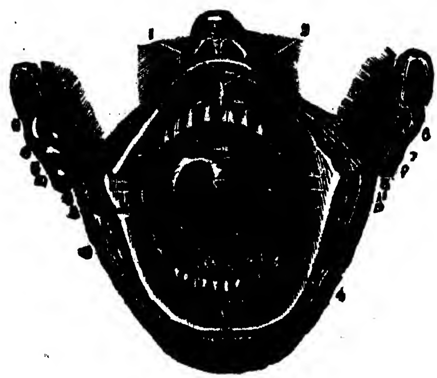


Fig. 121. The Mouth. 6. Mouth of duct from the Parotid Gland; 7. Roof of mouth; 8. Posterior Nares; 9. Fauces; 10. Uvula; 11. Tonsils; 12. Tongue.

The Mouth.—The mouth, the upper portion of the canal, guarded by the circular muscle of the lips, contains the teeth and tongue, and presents in its mucous membrane the orifices of the ducts of three pairs of secreting organs, known as the *salivary glands.* The back part of the mouth, usually known as the *pharynx,* communicates through the posterior nares with the nasal cavity; through the Eustachian canals, with the ears; through the upper end of the *larynx,* with the lungs: and through another opening at its extreme back part, with the stomach, by means of a canal known as the *œsophagus.* See Fig. 121.

The Teeth.—Each tooth has three parts, a *crown,* a *root,* or *fang,* and a *neck.* The crown is the part which appears above the gum. It is covered with a hard, dense substance, the hardest in the body, the *enamel,* which is in turn protected by a very thin covering not more than $\frac{1}{80000}$ of an inch in thickness, the object of which is to protect the enamel from the action of acids. The enamel prevents wear of the teeth in chewing hard substances. Its density varies much in different persons, often becoming soft in consequence of disease. The interior of the tooth presents a cavity which is filled by what is termed the pulp, which is made up of delicate blood-vessels and nerves entering the tooth through an opening for the purpose in one or more of the roots. The hard part of the tooth is chiefly made up of a bony substance called *dentine,* which is identical with ivory. The smaller teeth have but one fang, the larger two, or even three. The neck is simply the slight constriction between the crown and root.

The Milk Teeth.—Two sets of teeth are furnished most persons, some being so fortunate as to acquire a third in advanced age. The first set, called temporary or milk teeth, are twenty in number, ten in each jaw, consisting of four incisors, two cuspids,—sometimes called canine teeth, also eye-teeth in the upper jaw, and stomach-teeth in the lower,—and four molars, or double teeth. These are developed in the following order between the ages of seven months and two years: At seven months, the two central incisors, or front teeth; at eight months, the other two incisors; at one year, the first molars; at one year and a half, the cuspids; at two years, the second molars. See Fig. 122.

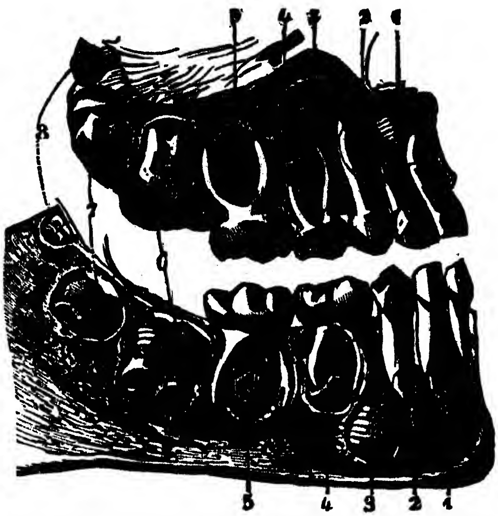


Fig. 122. The Temporary, or Milk Teeth. The cut shows at 1, 2, 3, 4, 5, 6, 7, and 8 the rudiments of the Permanent Teeth.

The Permanent Teeth.—Between six and seven years the permanent teeth, which number thirty-two in all, sixteen in each jaw, begin to appear. The permanent teeth comprise the same teeth as the temporary, with four small molars and two large ones in each jaw in addition. See Fig. 123. The first permanent teeth which appear are the first of the large molars, which come just back of the temporary molars, at about six and one-half years. At seven the central incisors are thrown off. The other incisors disappear the eighth year. In the ninth and tenth years the temporary molars give place to the permanent small molars. At twelve the cuspids are changed. During the thirteenth year the second large molars appear; between the seventeenth and twenty-first years the set is made complete by the appearance of the third large molars, or wisdom-teeth. The latter teeth are apt to decay early. The teeth in the lower jaw are generally developed somewhat earlier than those of the upper jaw. The roots of the first set of teeth are absorbed and probably help to form the second set.

It is important that mothers should be familiar with the proper

time for development of the several teeth, especially those of the first set, as many of the maladies of children are connected with "teething," and may often be prevented by proper attention to the teeth.

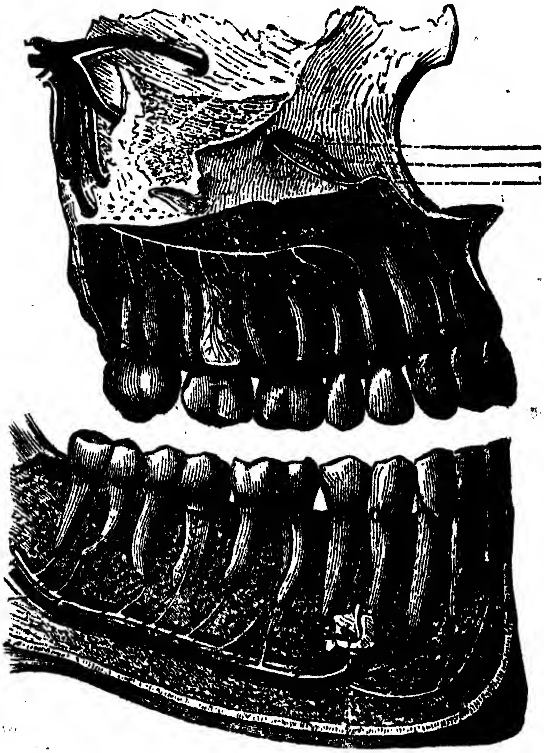


Fig. 123. The Permanent Teeth. The cut shows how each tooth is supplied with nerves and blood-vessels from the same nerve trunks and arteries which supply other parts of the face.

The Œsophagus.—This organ, commonly called the gullet, or meat-pipe, is a muscular canal about nine inches in length, extending from the back part of the mouth to the left upper portion of the stomach. Its walls contain two layers of muscular fibres, the outer layer running longitudinally, or lengthwise of the tube, the fibres of the other being circular in arrangement. When not in use, the walls of the œsophagus lie in contact, so that there is no opening. At the lower end, the circular fibres are sufficiently thickened to form a sphincter muscle, by means of which the contents of the stomach are prevented from escaping upward.

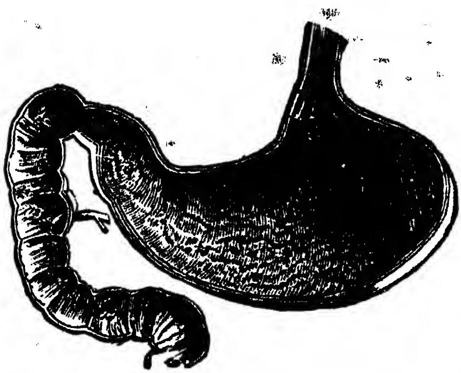


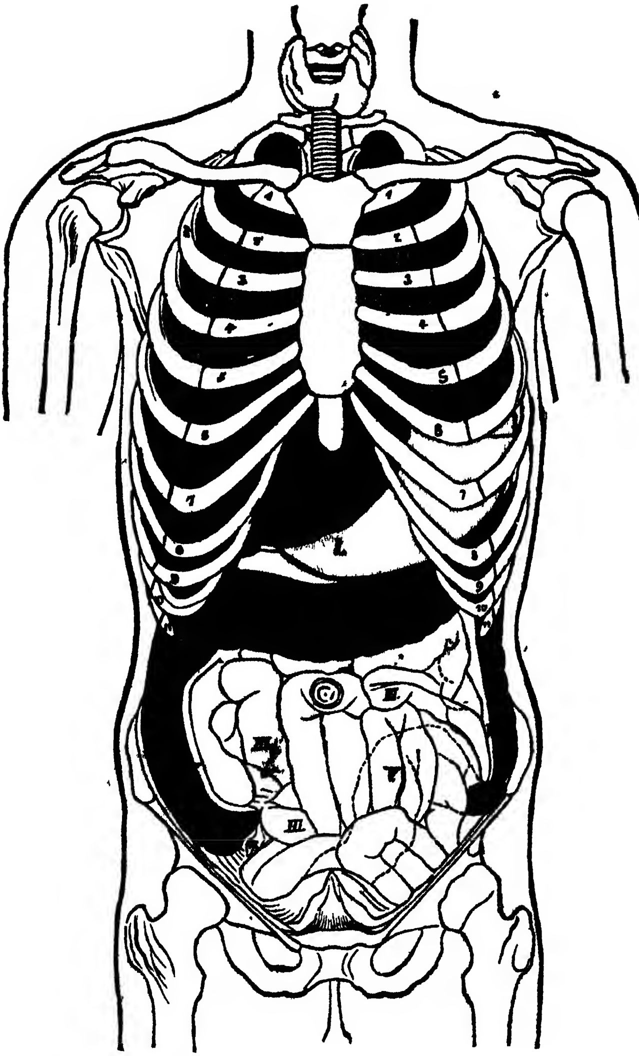
Fig. 124. The Stomach, with a portion of the Duodenum attached.

The Stomach.—This, though one of the most important, is by no means the essential organ of digestion, as was formerly supposed. Contrary to the old view, it is now understood that the stomach is only one of a series of organs which take part in the work of digestion, each of which has an important function to perform, as necessary in its place as that of any other.

The stomach may be briefly described as a hollow muscle. It is simply an expansion of the alimentary canal, which in the œsophagus is reduced to a narrow tube, but at the lower extremity of that organ abruptly expands into a pear-shaped viscus nine to twelve inches in length, and four to five inches in width, in its broadest part. It is capable of holding one to two quarts, but it will allow of considerable distension, so as to be made to hold much more than this quantity.

In early infancy, the stomach is a mere spindle-shaped expansion of the digestive tube; but as the individual advances in age, it becomes more irregular in shape, its lower border being convex, while its upper is concave in outline, as may be seen by reference to Fig. 124.

The walls of the stomach are made up of the outer serous coat, next to which is the muscular coat, made up of three distinct layers, the outer of which, like that of the œsophagus and of the whole alimentary canal, is longitudinal, the next inner layer being made up of circular fibres, and, in addition, still another set of fibres peculiar to the stomach, running in an oblique direction. Within the muscular coat, and lining the organ, is the mucous membrane, which, in addition to the usual characteristics of a mucous membrane, presents peculiar glandular structures, which have received the name of *peptic* glands, from the character of their secretion. These glands are tubular in structure, and are found in all parts of the stomach, but most abundantly in the left, or cardiac end of the stomach, the whole number being estimated at five millions.



In the above diagram the position of the stomach will be clearly seen, together with its relation to other internal organs. I. Stomach, partially covered by the liver and lungs; III. Small intestines; IV. Colon; V. Lower or sigmoid portion of the colon.

PLATE VII.—*INTERNAL ORGANS.*

Besides its peculiar glands, the gastric mucous membrane contains a remarkable arrangement of blood and lymphatic vessels designed to produce rapid absorption of liquids received into the stomach or prepared for absorption by the process of digestion. Covering the mucous membrane of the stomach everywhere, and lining its tubular glands, is a layer of living cells, known as epithelial cells, or epithelium. It is to these living, active molecules of life that the vital functions of this organ are chiefly due. By them are formed both the mucus which protects the surface of its delicate membranous lining, and the gastric juice for the solution of the food in gastric digestion. The epithelium itself also protects the membrane upon which it rests.

At the lower end of the stomach is a narrow orifice at which the circular muscular fibres are much thickened, forming a sphincter muscle; this is known as the *pylorus*, which literally signifies, "gatekeeper." The relative position of the stomach and of the other digestive organs may be readily seen by reference to PLATE VII.

The Small Intestine.—The pylorus forms the division between the stomach and the small intestine, which constitutes by far the greater portion of the alimentary canal, being about twenty feet in length. Its convoluted form, as seen in the diagram already referred to, is necessitated by its great length, which, together with the several functions which it performs, makes it by far the most important of the different portions of the digestive apparatus. See Fig. 120.

That portion of the small intestine joining the stomach is called the *duodenum*, which is about ten inches in length, and broader than the rest of the small intestine. In structure, the small intestine has the same general plan as that observed in the stomach; viz., an external serous coat, the *peritoneum*, then the longitudinal and circular muscular layers, and an inner lining of mucous membrane with its glands and epithelium. The mucous membrane of the small intestine presents a variety of glands, together with peculiar and remarkably well adapted structures for increasing the rapidity of absorption, known as villi. Figs. 125, 126, and 127.

The Liver and Pancreas.—Fig. 128. In close proximity to the duodenal portion of the small intestine are two large glands, the liver and the pancreas, each of which communicates with the intestine by a duct, the two ducts having a common orifice in the mucous membrane of the duodenum, a little more than five inches below the stomach.

Fig. 125. Villi of intestines slightly magnified. 1. A Solitary Gland; 2. Agminated or Clustered Gland.

The Colon.—At its lower extremity, the small intestine communicates with a greatly expanded portion of the alimentary canal, called the *colon*. The point of junction between these two portions is upon the right side, near the groin, and is guarded by a peculiar structure of the mucous membrane known as the *ileo-cæcal* valve. The colon is about five feet in length. It consists of the ascending, transverse, and descending portions, the last-named part having at its lower extremity the *rectum*. The peculiar structure of the colon is such as to well fit it for completing the process of digestion. Like the stomach and the small intestine, the colon has also its muscular and mucous coats, the latter containing various glands, most of which are excretory in character. The position of the colon and of its several portions will be readily seen by reference to PLATE VII.

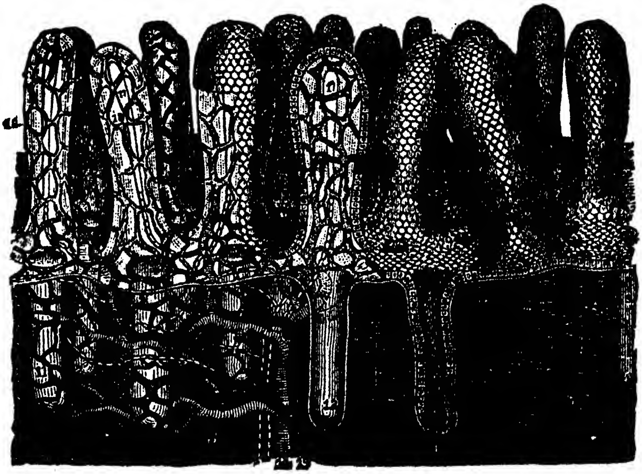


Fig. 126. The Villi of the intestinal mucous membrane. 14. Artery; 15. Vein; 16. Lacteal Vessels; 17. Lacteal Absorbents; 18. Venous Absorbents.

The Digestive Juices.—The apparatus of digestion thus far described is chiefly mechanical in its operation, serving to comminute

and transport the food. In some animals, as in some species of birds, this is the most essential part of the work of the stomach. In man and most animals, another class of agents is required; viz., a variety of fluids capable of reducing to a soluble and liquid condition the several elements of food, thus preparing them for absorption. We find these several fluids produced in the human digestive apparatus at the several points where they can accomplish the work required of them in the most efficient manner. They are five in number, and may be briefly described as follows:—

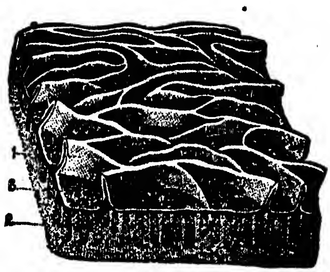


Fig. 127. 1. Folds of the intestinal mucous membrane; 2. Tubular Glands; 3. Mouths of the tubular glands.

The Saliva.—The first of the digestive fluids is formed by the three pairs of salivary glands located in the vicinity of the mouth and connected with it by a system of ducts, through which the salivary fluid is conducted into its cavity. As found in the mouth, the saliva is a mixed secretion, containing, in addition to the products of the three pairs of glands, mucus from the membrane lining the oral cavity. It is a clear, limpid fluid, slightly alkaline in character, and is produced in abundance by frugivorous and herbivorous animals. Carnivorous animals produce it in scanty quantity, having little need for it, as their food rarely contains the particular elements which the saliva is designed to aid in digesting. The quantity of saliva secreted by the human salivary glands is about three pints in twenty-four hours, of which about one-half is formed during digestion.

Fig. 128. A. Pancreas; B. Duodenum; C. Spleen.

The Gastric Juice.—This is an acid fluid formed only during digestion, by the peptic glands of the stomach. It is produced in great abundance, amounting, in twenty-four hours, to twelve or fourteen pints. Its activity as a digestive agent is due to a peculiar

principle which it contains, known as *pepsin*, which can be readily separated from the gastric juice, and can be extracted from the mucous membrane of the stomach after death. Large quantities of pepsin are manufactured in this way from the stomach of the hog. One firm with which we are acquainted employs for this purpose over three hundred hog stomachs daily. A similar principle is extracted from the lining membrane of the gizzard of fowls; and an enterprising foreigner has recently utilized the stomach of the ostrich for the same purpose.

The acidity of the gastric juice seems to be a condition necessary for the efficiency of pepsin, its active principle; but physiologists have not yet been able to determine the exact nature of the acid to which this property is due. It is most probable that pepsin itself, when existing in its normal organic combination, possesses acid properties.

The Pancreatic Juice.—This fluid, which so nearly resembles the saliva that it was once called "abdominal saliva," is the product of the pancreatic gland, which resembles the principal salivary glands in structure as closely as does its secretion the salivary secretion. This fluid is secreted only during digestion, and is then produced in considerable quantity, although the amount formed in twenty-four hours, or the quantity necessary for the digestion of a given amount of food, has not been ascertained. Like the saliva, the pancreatic juice is alkaline in character, and has an important office to perform in the digestion of certain food elements.

The Bile.—This fluid, usually considered an excretion, also seems to possess certain useful properties as a digestive agent. It is strongly alkaline, of a greenish color and bitter taste, and is produced most abundantly during digestion, although its secretion continues in a limited degree during the intervals of digestion. This fact well accords with the compound nature of the fluid, it being both a secretion and an excretion, the latter function evidently requiring continuous activity, while as a secretion its activity is demanded only at intervals.

The bile, in company with the pancreatic juice, enters the duodenum at a point about five inches below the stomach, so that, contrary to the old views of digestion, the bile is found in the stomach only under very exceptional circumstances.

The Intestinal Juice.—This, the most complicated of all the digestive juices, is the product of the activity of the numerous and

varied glands found in the mucous membrane of the intestines. Being a mixture of the secretion of a number of different glands, the intestinal fluid is of a compound character, which well fits it for its varied functions, as will be seen when we come to consider the physiology of digestion.

THE PHYSIOLOGY OF DIGESTION.

The Chemistry of Digestion.—While the numerous and really remarkable changes which take place in digestion are by no means chemical in character, in the sense in which the word is generally understood, yet we may allow the term if we understand that by it is meant, in this connection, not the reactions which take place in dead matter in obedience to the laws of chemical affinity, and which the chemist can command at will in his laboratory, but a living chemistry, working, through the laws of organized or living matter, changes infinitely more wonderful than any chemist can produce, and which he is powerless to imitate except through the same agencies.

Let it be understood, then, that digestion is not a chemical, but a vital process. Before the process was understood as well as it now is, the changes wrought were supposed to be those of fermentation, to which, indeed, the process is in some degree analogous; but we now know that fermentation occurs in conjunction with digestion only as an incidental and abnormal—though, unfortunately, a very common—process.

The Elements of Food.—A correct understanding of the philosophy of digestion and its derangements cannot be obtained without a knowledge of the nature of food and of its relation to the digestive organs in general, and to each of the digestive juices. The demand for food is created by the wearing out of the tissues by the vital activities in which they are employed. Every vital action, no matter how slight, is performed at the expense of certain portions of the living tissues. New material is constantly required to supply the want created by this waste. As there is a great diversity in the character of the several tissues of the body, it is necessary that the food should contain a variety of elements in order that each part may be properly nourished and replenished. Classified according to their relation to the digestive organs, the elements of food may be divided into the following classes:—

1. Farinaceous and saccharine.
2. Albuminous.
3. Fatty.
4. Indigestible.

These elements are sometimes found in an isolated state; but ordinarily they are combined in varying proportions. Nearly all food contains a larger or smaller proportion of each.

For description of the several classes of food, see chapter on "Medical Dietetics."

Action of the Saliva.—The saliva contains a peculiar organic principle which possesses the property of converting starch into sugar. This property of the saliva can be studied at will in the following manner: Place in the mouth a fragment of a dry cracker containing no sugar, or a small portion of well-boiled rice. Now chew it for five minutes. It will be observed that after the first few seconds it begins to have a perceptible sweet taste, which increases as the mastication is continued. A quantity of pure starch treated in the same manner will secure the same result. Evidently, sugar is formed during the chewing, as it did not exist in the starch before it was masticated. While undergoing the process of chewing, the saliva was brought in contact with the starch, converting it into sugar. The chemical test for sugar also shows its presence.

It was formerly supposed that the action of the saliva ceased as soon as the food entered the stomach; but recent investigations seem to show that this is an error. The diastatic ferment of the saliva is more active in a neutral than in an acid medium, consequently for a time after the masticated food enters the stomach, the activity of the saliva in converting starch into sugar increases, gradually diminishing as the contents of the stomach become more and more acid, and ceasing altogether, in healthy persons, at the end of one hour. In persons suffering from hypopepsia or apepsia, the gastric digestion of starch continues longer. This subject is one of much greater importance than has generally been understood, as is clearly shown by the extensive experiments made by the writer in the Laboratory of Hygiene of the Battle Creek (Mich.) Sanitarium.

The secretion of saliva is excited by the presence of dry food in the mouth, or by sweet, acid, or other sapid substances. Even the odor of agreeable foods will excite the secretion very strongly. It is also increased to a considerable extent by the act of chewing. Acids, particularly oxalic acid and the acetic acid of vinegar, destroy the action of the saliva even when present in very small proportions.

Action of the Gastric Juice.—After many years of patient study and experimentation, physiologists have at last arrived at a quite accu-

rate knowledge of the nature of the gastric juice and of its action upon the food. About the first knowledge gained was by an ingenious experimenter who inclosed different kinds of food in small perforated wooden tubes which he swallowed, and afterward vomited. He found that albuminous substances were dissolved in the stomach, so that the wooden tubes containing such foods were vomited empty, while those containing starch and fatty substances remained unchanged. Some years later, a most remarkable opportunity for the study of the gastric juice and its action was afforded by a serious accident suffered by a young Canadian. While hunting, he received in his side the full charge of a gun loaded with buck-shot and fired at the distance of a few yards. An immense rent was made in his body, which exposed not only the lungs but the inside of the stomach. Fortunately, the wounded man fell into the hands of Dr. Beaumont, an unusually intelligent physician, by whose skillful care, together with his own powerful constitution, he was restored to health after many months of suffering and imminent peril to life from the extensive sloughing of the soft parts, with injured ribs and cartilages, being finally left with a large opening through the abdominal wall into the stomach. Through this opening the food was, at first, expelled after each meal, unless retained by a bandage; but after the lapse of a few months, thoughtful nature drew a membranous curtain before it, when the injured man suffered no further inconvenience, although he could expel food through the opening at will, and often performed the experiment of drinking a quart of milk and pouring it out through the abdominal opening. The accident served in no way to interfere with his general health, and he lived to the age of more than seventy years.

Dr. Beaumont was not slow to embrace this excellent opportunity for observation and study, and retained St. Martin for several months, and at intervals for a number of years, for the purpose of experiment and investigation. Allowing him to eat various articles, he had but to push aside the little curtain, and the long-studied mystery of stomach-digestion appeared before his eyes, solved by an accident. Dr. Beaumont soon discovered that the principal work of the gastric juice is to dissolve the albuminous elements of food. This conclusion was also proven then, as it has been hundreds of times since, by the fact that a portion of pure gastric juice, collected from the stomach, possesses the property of dissolving albuminous substances, as meat, boiled eggs, the curd of milk, gluten, etc. In repeating the experiment, physiologists

have purposely produced similar openings in the stomachs of dogs, thus enabling them to collect a quantity of gastric juice for examination at any time desired. It is even possible to separate from the gastric juice, or from the mucous membrane of the stomach of various animals, *pepsin*, the active principle of the gastric juice, and by means of it to experiment at pleasure upon its digestive properties. The pepsin which can be extracted from the stomach of a healthy dog has been estimated to possess sufficient digestive power to dissolve two hundred pounds of albumen, which would be equivalent to more than two thousand eggs.

It has also been observed that the gastric juice of calves, horses, and other herbivorous animals is much less active in digesting animal food than that of carnivorous animals.

The secretion of gastric juice is excited by the presence of food in the stomach, especially of semi-solid food, by the presence of the saliva, by sudden alternations of heat and cold, especially by the application of heat. A temperature less than that of the body causes its action to cease; a slight elevation of temperature increases its activity. Alcohol, alkalies, and tannin antagonize its action, since they precipitate the pepsin and the digested albuminous elements. Bile, which is occasionally forced upward into the stomach, has the same effect. Antiseptics of all sorts, that is, such substances as will prevent fermentation, also interfere with digestion. The metallic salts, as compounds of lead, zinc, iron, copper, etc., together with compounds of lime, magnesia, and other salts found in hard water, hinder digestion.

It has been supposed that acids of all sorts aid digestion, which theory has led to the frequent recommendation of vinegar and other acids, especially with articles difficult of digestion. This theory has been opposed by those who studied dietetics practically rather than theoretically, and now M. Charles Richet, a distinguished physician of Paris, comes forward with the assertion that he has demonstrated that acetic, tartaric, and all similar acids diminish the secretion of gastric juice while they are in no sense substitutes for it, and so hinder digestion.

Action of the Bile.—It has long been well known that the bile is an excrementitious fluid; but more recent investigations show that it also performs several important offices in the process of digestion. Being alkaline, it neutralizes the gastric juice, which would otherwise interfere with intestinal digestion. The alkaline character of the bile also enables it to emulsify the fatty elements of the food, and by thus permanently dividing the fat into very small particles, renders possible its absorption. It is probable, also, that the alkaline

elements of the bile to some extent saponify the fats, and thus render them soluble in water. The bile also acts as an antiseptic to preserve the food while in the intestinal canal. An additional office of this digestive fluid is to stimulate the absorption of the digested food, as well as to encourage activity of the intestinal mucous membrane. Deficiency in the quantity of the biliary secretion is a cause of constipation.

Action of the Pancreatic Juice.—This peculiar digestive fluid is unlike those which have been previously mentioned, in that its action is not confined to a single element of the food. It digests starch, albumen, and fats. The most recent experiments on the subject also seem to show that the pancreatic juice acts upon the albuminous elements of food most readily after they have first been acted upon by the gastric juice, especially caseine, so that it really completes the digestion of all the elements, with the exception of cane sugar.

Action of the Intestinal Juice.—This fluid, of still more complicated nature than the pancreatic, digests all three of the classes of digestible foods, acting alike upon the farinaceous, the albuminous, and the fatty elements of food. This complicated function well corresponds with the compound nature of the secretion, it being the mixed product of several glands. The intestinal juice seems to have little power to dissolve the elements of the food unless they have first been acted upon, to some extent at least, by the other digestive juices, with the exception of cane sugar, which it alone of all the digestive fluids is able to digest, changing it to grape sugar and lævulose.

Review of the Action of the Digestive Juices.—Having now considered in detail the action of each of the digestive juices, we find that of the five separate fluids, three digest one each of the three classes of digestible food, while one of the remaining two digests all of the elements, except cane sugar, and the other, the whole food. Considering the nutritive elements, we find starch, albumen, and fats, each digested by three digestive fluids; starch by the saliva, the pancreatic juice, and the intestinal juice; albumen by the gastric, pancreatic, and intestinal juices; and fats by the bile, the pancreatic, and intestinal juices. Cane sugar is digested by but one digestive fluid, the intestinal, the last and the least of all the fluids, from which we may infer that this element should not hold a very conspicuous place in the dietary.

The Digestive Process.—Before the middle of the last century, very little was understood respecting the real nature of the phenomena which together make up the complete process of digestion. Since that time, the subject has been studied so carefully and patiently that physi-

ologists have now arrived at a pretty clear understanding of the matter. By studying the digestion of dogs with an artificially produced gastric fistula, and especially the digestive process in human beings, by the aid of the stomach-tube, great advances have been made in the knowledge of the digestive processes, within the last decade. A stomach-tube being passed into the stomach an hour after a meal of definite composition, the organ is, so to speak, surprised in the midst of its work, and any deficiency or morbid process may be discovered by the refined methods of investigation which chemistry has placed in our hands.

The method of investigation of functional disorders of the stomach, perfected by the writer and employed in nearly 5000 cases, is epitomized in the blank upon which the results of analyses are recorded (see Appendix). As before remarked, the digestive apparatus consists of a series of organs, of which the stomach is only one, and perhaps not the most important, since life can long be sustained without the activity of the stomach, by alimentation through the lower bowels. Each one of the series of organs acts upon the food; and the arrangement is such that the prompt and thorough action of each organ is essential to the successful action of the succeeding ones.

In order to simplify the idea of digestion in the mind of the reader, we may remark at this point a fact which is well sustained by the most careful study of the process, that digestion really depends upon two distinct vital actions; viz., secretion and muscular action. The alimentary canal is simply a muscular tube lined with mucous membrane, along which are situated, at different intervals, secreting organs which pour into its cavity their potent juices by means of which the contents of the tube are, if possible, rendered soluble and dissolved. The chief objects of the muscular canal seem to be to move the food along and bring it in contact with the active agents of digestion. With this general view of the subject, let us now consider the several steps in the process.

In order to form an idea of normal or healthy digestion, let us observe the process in a healthy man, in whom all parts of it are purely physiological. He sits down to his breakfast about one hour after rising, having taken a little gentle exercise to arouse the activities of the system, and perhaps taken a small quantity of water half an hour before, to supply the demand for fluid without taking too much at the meal and to excite the gastric and intestinal secretions, as well as that of the liver, thereby insuring both an active digestion and proper activity of the bowels.

Mastication.—Our subject places in his mouth a small variety of foods containing in proper proportion the several elements of nutrition, and simply prepared, without the admixture of stimulating or irritating spices and condiments. As the food is slowly received, it is thoroughly masticated, being ground and triturated by a set of sound teeth, capable of vigorous use, and aided by the salivary secretion, until it is reduced to a pulpy mass.

Insalivation.—At the same time that this grinding process is going on, the saliva, while also aiding the mechanical division of the food, is performing its specific work upon the starch of which the food is likely to be largely composed, converting it into sugar, so that the mass of food, or alimentary bolus as it is termed, becomes sweeter in flavor the longer it is chewed.

Stomach Digestion.—After thorough mastication, each mouthful of food is in turn swallowed, being drawn down into the stomach by the muscles of the œsophagus, not simply dropping into that organ through an open tube, as might be supposed, the œsophagus being always closed, excepting only that portion which is occupied by the food in its passage to the stomach. Shortly after the food has reached that organ, its mucous membrane assumes, according to the observations of Beaumont on the stomach of Alexis St. Martin, a rosy appearance, and there may be seen oozing from its surface the gastric juice in tiny drops like perspiration on the skin. The secretion increases rapidly, and begins at once its specific action on the albuminous elements of the food, which have been made accessible by thorough mastication, which has broken up the food structures in such a manner as to expose freely all its different elements. It may occur that the gastric secretion has been excited before the food has been swallowed; in which case there is no delay whatever in the commencement of gastric digestion.

Dr. Beaumont observed, in watching patiently at the curious window-like opening in the stomach of St. Martin, that very soon after food is received into the stomach, the muscular structures of that organ begin to act, setting up a sort of churning process, turning the food over and over, squeezing, pressing, and variously manipulating it, moving it along its lower border toward the pylorus, and returning it along its upper border to the pouch-like left extremity into which it is first received from the œsophagus.

If the food contains a large quantity of fluid, this is absorbed before the process just described begins, since it is evident that too great

an amount of fluid would effectually prevent such action on the food by the muscular walls of the stomach. It is obvious, also, that a considerable amount of bulk is needed in the food, to enable the stomach to operate upon it effectually. When milk is taken, it is quickly coagulated by the gastric juice, and the whey being absorbed, the gastric juice acts upon the masses formed. Soups, gruels, and all fluid foods, are thickened by partial absorption of their watery constituent.

At the same time that the gastric juice is acting upon its special elements, the digestion of starch continues through the activity of the saliva for at least the first half hour of gastric digestion, or until neutralized by the gastric juice. Absorption of the portions of the food which are rendered liquid by digestion is all the time taking place, so that the semi-solid character of the mass is in a measure preserved.

After this process has continued for a time, which is longer or shorter according to the nature of the food or the manner of its preparation, portions of food begin to pass out of the stomach. As the mass is moved along the lower border of the stomach toward the pylorus, and back along the upper border to its opposite extremity, all portions of the stomach contents are successively brought in contact with the pylorus; and as the contraction of the stomach walls becomes more and more vigorous, owing to the increasing acidity of the gastric juice, those portions of the food which have become reduced to a fluid state are squeezed out through the pylorus. The so-called "selective function" of the pylorus is thus a purely mechanical process, it simply serving to retain the stomach contents until they have been reduced to a fluid state. Hard substances which cannot be digested in the stomach are forced more and more within the grasp of the pyloric muscle and finally crowded through it into the duodenum. After a time, the acidity of the food becomes so great from the increase of gastric juice, that the stomach is excited to strong contraction, and the whole mass is crowded through the pylorus into the small intestine, where the work is completed. The length of time intervening between the ingestion of food and the emptying of the stomach varies from an hour or an hour and a half, when the article eaten is boiled rice or a mellow apple, to between five and six hours after eating fat pork or similar food. The figurative expression used by laborers who claim that pork is an excellent article of food because it "sticks by the rib," rendered literally, means

that it is so difficult of digestion that the stomach has hard work to get rid of it after it has been received.

Intestinal Digestion.—While stomach digestion has been going on, the gastric juice acting upon the albuminous elements of the food, and the digestion of the starch slowly progressing, the fatty elements of the food have undergone no changes except such as have resulted from the elevated temperature. Being to some extent freed from its association with the other elements, the fat floats upon the surface of the contents of the stomach, when fluid, but undergoes no further change until it comes in contact with the bile and pancreatic juice in the duodenum, when those fluids act upon it in the manner already described. The pancreatic juice also acts vigorously upon the portions of starch remaining undigested, and such portions of albumen as may have escaped digestion or absorption in the stomach.

We now have all the elements of food acted upon by the saliva, gastric juice, bile, and pancreatic juice, with the exception of cane sugar; but, lest any portion should escape undigested, nature provides the intestinal juice, which continues its action upon all the elements of food during the whole of its passage through the small intestine, and perhaps to some extent in the large intestine also, acting also upon cane sugar.

During the process of intestinal digestion, the food is slowly moved along through the twenty-five feet of small and large intestines, gradually becoming more and more solid by the absorption of the portions rendered fluid by the digestive juices, and also gradually being more and more completely deprived of its nutrient elements, until at last there is left in the lower part of the large intestine nothing but the innutritious residue of the food, mixed with the excrementitious matter, or feces, which are destined in due time to be discharged from the body, such a discharge occurring normally as often as once in twenty-four hours, in most persons, and usually in the morning, before or just after breakfast.

Absorption.—The process of absorption begins almost as soon as food is taken into the mouth, and continues so long as any soluble nutriment can be extracted from the alimentary mass. The work of absorption is performed by two sets of absorbent vessels, minute veins, and lymphatics, here called lacteals. The venous absorbents take up whatever is held in solution in the fluid taken into the stomach, and the principal portion of the digested farinaceous, saccharine, and albu-

minous elements of food. The lacteals (see Fig. 129) absorb the emulsified fats, and some portion of the other elements. The products absorbed by the venous absorbents find their way into the general circulation through the hepatic vein, after passing through the liver, which is apparently a wise arrangement of nature, to provide for a sort of filtration before the more delicate tissues of the body are exposed to the action of whatever deleterious elements the food may happen to contain. It is claimed by physiologists that the liver has also an important function to perform in completing the work of digestion, especially that of starchy substances. The food mingled with venous blood is conveyed to the liver by the portal vein. Those products which are absorbed by the lacteals, reach the general circulation through the thoracic duct, a long, slender lymph vessel which empties into the large vein from the arm on the left side.

Fig. 129. A portion of the Intestinal Canal showing Mesenteric Glands and Lacteals.

Oxygenation.—From the right heart the mixed products of digestion are sent to the lungs, where, by coming in contact with the oxygen of the air, the final change is effected, whereby heterogeneous organized matter is converted into human blood, with properties and qualities to nourish and repair each of the great variety of delicate tissues found in the body. After the blood has passed through the lungs, neither sugar nor fat, which may abound in the blood before its oxygenation, are found.

We have now traced through its various subdivisions the entire process of digestion, and found, until we came to the process of absorption, that, as at first remarked, the process chiefly depends on two vital actions; viz., muscular action and secretion. Muscular action masticates the food—by the aid of the passive accessory organs, the teeth—and mingles with it the saliva. Muscular contraction draws the alimentary bolus from the mouth down into the stomach. Here,

by the action of the muscles, it is churned up with the gastric juice, and finally squeezed through the pylorus into the small intestine, where, by the aid of muscles, it is mixed with the bile and the pancreatic and intestinal juices, and is moved along, constantly coming in contact with fresh secreting and absorbing surfaces, until its digestion is complete. Even absorption is greatly aided by this muscular action, as the circulation in the absorbing parts is thereby quickened, so that larger quantities of fluid are taken up.

Nervous Relations.—Before leaving the physiology of digestion it should be noted that both the secretion of the digestive fluids and the muscular action of the stomach and intestines are under the control of nerves. The digestive organs are all intimately connected with the general nervous system, so that any change in one is readily noted in the other. A demand for nutriment in the general system is referred to the stomach as hunger, just as the demand for liquid is referred to the throat as thirst. Undigested food, or any other obnoxious substances in the stomach, may excite a nausea which will relax and prostrate the whole system. In certain states of the system, and especially in young children, disorder of digestion may even produce convulsions. On the other hand, we see that agents which affect the general nervous system often influence the digestive organs indirectly with almost the promptness of agents addressed directly to them. The sight or smell of savory viands will "make the mouth water" by exciting the salivary secretion. Seeing or smelling disgusting objects will not infrequently cause prompt emesis, when there is nothing whatever in the stomach to occasion vomiting. In a case which came under our observation a few years ago, a gentleman was deprived of several meals by having had the misfortune to meet a very loathsome object. Whenever he attempted to eat, an image of the repulsive object came before his mind, and the immediate nauseating effects were so great as to make it impossible for him to keep anything in his stomach. On more than one occasion a patient has been made to vomit by being told that he had taken an emetic, when the dose he had swallowed was inert.

Vomiting.—This is evidently a result of reflex nervous action in most cases. The exact mechanism of the act we do not need to explain, except to say that the expulsive effort is made chiefly by the abdominal muscles and the diaphragm, the stomach taking little active part in the process; being powerfully compressed against the rigid

diaphragm, by the vigorous contraction of the abdominal muscles, its contents are forcibly expelled upward through the œsophagus, contraction of the pylorus preventing exit from the stomach in a downward direction.

Retching is an effort of the same character as vomiting, only less in degree. Gulping is a peculiar action by which air is drawn down into the stomach. It frequently precedes vomiting, having the effect to relax the sphincter muscle at the lower end of the œsophagus. Other abnormal actions connected with the stomach and bowels will be explained in connection with the diseases of these organs.

HYGIENE OF DIGESTION.

Probably no part of the vital economy is subjected to so much abuse as the digestive organs. The majority of people eat and drink what their fancy or tastes call for, not once taking into account any possible injury which may result to the stomach from what is put into it. The stomach is treated like a garbage box, and then is expected to do its duty, or rather to dispose of the indigestible messes imposed upon it, promptly and uncomplainingly. If it lags a little in weariness from overwork, instead of being allowed to rest like any other organ of the body when tired, it is whipped up and goaded on by stimulants in the shape of spices, mustard, pepper, and other condiments, and often even with wine, beer, ale, brandy, and other artificial means of getting out of an organ more work than it is able to do.

The importance of this subject demands serious attention. Its neglect has made the American people a nation of dyspeptics. We may therefore be justified in devoting considerable space to this topic, and going quite fully into the details of it, so that some practical benefit may be derived from its consideration.

From our study of the anatomy and physiology of digestion we have acquired a pretty good knowledge of the principles of the subject. Now let us apply these principles, and by so doing we shall be able to discover that many of the most common customs relating to eating and drinking are in direct opposition to the laws of healthy digestion. And first, as one of the most common of all dietetic errors we will mention—

Hasty Eating.—That Americans are everywhere noted for the precipitate manner in which they bolt their meals, tumbling into their

stomachs indiscriminately material that is digestible and indigestible, and spending only enough time to reduce the food to a sufficient degree of fineness to allow it to be swallowed without choking,—often hardly enough for safety in that regard,—is too well known to require special confirmation. The average American eats as he works, recreates, and does everything else, in fact, on the high-pressure system. He treats his mouth like a corn-hopper, and his stomach like a garbage box.

The evils resulting from hasty eating may be enumerated as follows :—

1. From deficient mastication, the food is not properly divided, so that the digestive juices cannot gain access to its various elements.

2. By being retained in the mouth too short a time, an insufficient amount of saliva is mingled with it, so that salivary digestion cannot be properly performed. As the saliva is also a stimulus to the secretion of gastric juice, stomach digestion must necessarily be imperfect.

3. Again, the food entering the stomach in a coarse, unmasticated state, may act as a mechanical irritant to the delicate lining of the stomach, and thus occasion congestion and gastric catarrh, one of the most common disorders of the stomach, and one which is often very obstinate in its nature.

Drinking at Meals.—In addition to the evils which it occasions directly, hasty eating induces an individual to drink largely of hot or cold liquids to wash the food into the stomach. Thus, two evils are associated. Liquid of any kind, in large quantity, is prejudicial to digestion because it delays the action of the gastric juice, weakens its digestive qualities, and checks the secretion of saliva. In case the fluid is hot, if in considerable quantity, it relaxes and weakens the stomach. If it is cold, it checks digestion by cooling the contents of the stomach down to a degree at which digestion cannot proceed. Few people are aware how serious a disturbance even a small quantity of cold water, iced cream, or other cold substance, will create when taken into a stomach where food is undergoing digestion. This process cannot be carried on at a temperature less than that of the body, or about 100°. Dr. Beaumont observed that when Alexis St. Martin drank a glassful of water at the usual temperature of freshly drawn well-water, the temperature of the food undergoing digestion fell immediately to 70°, and did not regain the proper temperature for more than half an hour.

Of course the eating of very cold food must have a similar effect, making digestion very tardy and slow. If any drink at all is taken, it

should be a few minutes before eating, time being allowed for absorption before digestion begins, or an hour or two afterward. If the meal is mostly composed of dry foods, a few sips of warm or moderately hot water will be beneficial rather than otherwise, taken at the beginning of the meal or at its close. The habit of drinking during the meal should be discontinued wholly, and especially by those whose digestive powers are weak. If the diet is of proper quality, and the food is well masticated, there will be little inclination to eat too much. When the food is rendered fiery and irritating with spices and stimulating condiments, it is no wonder that there is an imperious demand for water or liquid of some kind to allay the irritation.

Eating too Frequently.—One of the most pernicious customs of modern society is that of frequent meals. This custom is seen in its extreme development in England more clearly than in this country, five meals a day, including lunches, being there thought none too many. The idea seems to prevail that the stomach must never be allowed to become empty under any circumstances. In this country, three meals a day is the general custom, though more are often taken. Healthy digestion requires at least five hours for its completion, and one hour for rest before another meal is taken. This makes six hours necessary for the disposal of each meal. If food is taken at shorter intervals than this, when ordinary food is eaten, the stomach must suffer disturbance sooner or later, since it will be allowed no time for rest.

Again, if a meal is taken before the preceding meal has been digested and has left the stomach, the portion remaining, from its long exposure to the influence of warmth and moisture which especially favor fermentation, is likely to undergo that change in spite of the preserving influence of the gastric juice, and thus the whole mass of food will be rendered less fit for the nutrition of the body, and the stomach will be liable to suffer injury from the acids developed.

Eating between Meals.—This is a gross breach of the requirements of good digestion. The habit many have of eating fruit, confectionery, nuts, sweetmeats, etc., between meals, is a certain cause of dyspepsia. No stomach can endure such usage. Those who indulge in this manner usually complain of little appetite, and wonder why they have no relish for their food, strangely overlooking the real cause, and utterly disregarding one of the plainest laws of nature.

This evil practice is often begun in early childhood. Indeed, it is too often cultivated by mothers and the would-be friends of little

ones, who seek to gratify them by presents of confectionery and other tidbits of various sorts. Under such a regimen, it is not singular that so many thousands of children annually fall victims to stomach and intestinal diseases of various forms. In great numbers of cases, early indiscretions of this sort are the real causes of fully developed dyspepsia in later years.

Irregularity of Meals.—Another cause of this disease, which is closely related to the ones just mentioned, is irregularity respecting the time of meals. The human system seems to form habits, and to be in a great degree dependent upon the performance of its functions in accordance with the habits formed. In respect to digestion this is especially observable. If a meal is taken at a regular hour, the stomach becomes accustomed to receiving food at that hour, and is prepared for it. If meals are taken irregularly, the stomach is taken by surprise, so to speak, and is never in that state of readiness in which it should be for the prompt and perfect performance of its work. The habit which many professional and business men have of allowing their business to intrude upon their meal hours, quite frequently either wholly depriving them of a meal or obliging them to take it an hour or two later than the usual time, invariably undermines the best digestion, in time. Every individual ought to consider the hour for meals a sacred one, not to be intruded upon under any ordinary circumstances. Eating is a matter of too momentous importance to be interrupted or delayed by ordinary matters of business or convenience. The habit of regularity in eating should be cultivated early in life. Children should be taught to be regular at their meals and take nothing between meals. This rule applies to infants as well as to older children. The practice of feeding the little one every time it cries is a most serious injury to its weak digestive organs. An infant's stomach, though it needs food at more frequent intervals,—two to four hours according to its age,—requires the same regularity which is essential to the maintenance of healthy digestion in older persons. The irregularity usually practiced is undoubtedly one of the greatest causes of the fearful mortality of infants from disorders of the digestive organs, as appears in our mortuary reports.

The subject of infant feeding is a very important one, and on this account we have devoted considerable space to it in the chapter on "Medical Dietetics," which see.

The Proper Number of Meals.—How many meals should be taken by a person in health? The answer to this question depends somewhat upon the habits of the individual, his occupation, number of hours of labor, etc. There is good reason to believe that for a large share of those who now take three to five meals a day, two would be much better. According to Hippocrates, the ancient Greeks ate but two meals a day. This was the prevailing custom in olden times. Indeed, the modern frequency of meals is the outgrowth of a gradual losing sight of the true function of food and of eating, and making the gratification of the palate the chief object, instead of the nourishment of the body. It is distinctly a modern custom. That the system can be well nourished upon two meals a day is beyond controversy, seeing that not only did our vigorous forefathers require but two meals a day, but hundreds of persons in modern times have adopted the same custom without injury, and with most decided benefit. Students, teachers, clergymen, lawyers, and other literary and professional men, will be especially benefited by this plan. We have employed it for about fifteen years, and with great benefit. The special advantages gained by it are, 1. The stomach is allowed a proper interval for rest; 2. Sleep is much more recuperative when the stomach is allowed to rest with the balance of the body; 3. Digestion cannot be well performed during sleep.

If six hours are allotted to each meal, and the proper length of time is allowed to elapse before going to sleep after the last meal, it will be found impossible to make any arrangement by which opportunity can be secured for the necessary eight hours' sleep at night. Not more than two meals can be taken when a person complies with all the laws of health.

If more than two meals are required by any one, it is by those who are engaged for twelve or more hours per day in severe physical labor. Such persons are better prepared to digest a third meal than those whose occupation is mental or sedentary, and they may at least take it with less detriment, though we are still doubtful whether a third meal is needed, even for such.

Eating when Tired.—This is one of the most certain causes of derangement of digestion, and one to which a very large number of cases of dyspepsia may be traced. The third meal of the day is almost always taken when the system is exhausted with the day's labor. The whole body is tired, the stomach as well as the rest. The

idea that by the taking of food, the stomach or any other part of the system will be strengthened, is an error. When the stomach has a "faint and tired" feeling at night, of which many complain, what it wants is not food, but rest. A writer on indigestion says very truthfully, "A tired stomach is a weak stomach." When the stomach feels "weak and faint," rest is what is demanded, and is the only thing that will do it good; yet many people insist on putting more food into it, thus compelling it to work when it ought to be allowed to remain inactive until rested. The arm wearies by constant exercise, and so does the stomach, which is largely composed of muscles as well as the arm. Both secretion and muscular activity must be much lessened in a tired stomach, and the habitual disregard of this rule must be disastrous to the best digestion.

Violent exercise at any time just before or just after eating is inimical to good digestion, for the reason already assigned when the exercise is taken just before the meal, and because the vital energies are diverted to other parts—thus robbing the stomach of its necessary share—when the exercise is taken immediately after eating. An English physiologist performed an experiment which well illustrates the truth of this position. Having fed a dog his usual allowance of meat one morning, he took him out upon a fox hunt, and kept him racing over the country until night, when, having killed the animal, he examined his stomach at once and found the meat in the same condition in which it entered his stomach, no digestion having taken place. In another dog, fed with the same kind of food, but left quiet at home, digestion was found to be complete.

The hurry and press of business among Americans is allowed to override every consideration of health. It seems never to enter the thoughts of the average business man that any time is required for digestion. Rushing to his dinner from the plow, the workshop, or the counting-room, he swallows his food with all possible dispatch, and rushes back to his work again, begrudging every moment spent in meeting the requirements of nature. Many years ago, it was a custom in Edinburgh to suspend all business in the middle of the day for two hours, so as to allow ample time for meals. A similar custom once prevailed in Switzerland, we have been informed; but we presume that such a sensible custom is now considered too old-fashioned to be tolerated.

It should be remarked that severe mental labor immediately before or after, and especially during meals, is even more injurious than

physical employment. The habit many business men have of anxiously scanning the newspapers during their meals and when going to and from their places of business, is a bad one. A full hour, at least, should be taken for the midday meal; and if an hour's rest can be secured before eating, improved digestion would well repay the time spent in re-inforcing the vital energies. For persons of weak digestion, the rest before eating is in most cases indispensable.

The famous *L'Homme serpent* (man snake), of Paris, who astonished the world by his agility and wonderful contortions, ate but two meals a day of vegetable food, and invariably abstained from food for twelve hours before performing, a plan which was undoubtedly mutually advantageous to his muscles and his stomach, as his exercises required great muscular effort.

Sleeping after Meals.—While rest from accustomed exercise after eating is important, it should be noted that sleep at this time is equally as bad as vigorous exercise of either mind or body. Good digestion cannot take place during sleep. While it is true that digestion is an involuntary act, it should be recollected that it is dependent upon the activity of the nervous system for its proper performance. The same nerve which secures activity of the respiratory organs, the *pneumogastric*, controls the muscular activity of the stomach and intestines. During sleep, from the lessening of nervous activity both the respiration and the circulation are greatly lessened in vigor. It is but reasonable to suppose that the activity of the digestive organs is decreased at the same time, being controlled by the same nerves. Actual experiment shows this to be true. Most people who lie down and sleep an hour or two soon after taking food, awake feeling anything but refreshed. The suspension of the process to a considerable degree during sleep causes imperfect digestion with its numerous unpleasant symptoms. In the case of old people it may sometimes be beneficial, or at least not harmful, to secure a few minutes' sleep after eating, before digestion is well begun, but it must not be long continued.

In order to secure the best conditions for digestion after eating, an individual should take gentle exercise of some kind, as walking, carriage or horseback riding. While violent exertion seriously interrupts the digestive process, a moderate degree of physical exercise facilitates the process by increasing the muscular activity of the digestive organs and thus encouraging both secretion and absorption.

Late Suppers.—Eating late at night, when the muscular and nervous systems are exhausted by the labor of the day, and then retiring soon to rest, is one of the most active dyspepsia-producing habits to which modern society is addicted. As before explained, "a tired stomach is a weak stomach;" and in addition, we may add, a sleepy stomach is a sluggish one. Secretion must of necessity be deficient in both quantity and quality, owing to the exhausted condition of the system; and with the further obstacle afforded to prompt digestion by the slowing of the vital operations during sleep, it is almost impossible that there should be other than disturbed digestion and disturbed sleep in consequence. It is under these circumstances that people often suffer with obstinate insomnia, bad dreams, nightmare, and similar troubles, from which they arise in the morning unrefreshed, and unrecuperated by Nature's sweet restorer, the work of assimilation, by which repair takes place, having been prevented by the disturbed condition of the nerves.

No food should be taken within three or four hours of retiring. This will allow the stomach time to get the work of digestion forward sufficiently to enable it to be carried on to completion without disturbance of the rest of the economy. The last meal of the day, if three meals are taken, should be a very light one, preferably consisting of ripe fruit and simple preparations of the grains. The custom which prevails in many of the larger cities of making dinner the last meal of the day, eating of articles the most hearty and difficult of digestion as late as six or even eight o'clock, is one that ought to be discountenanced by physicians. It is only to be tolerated at all by those who convert night into day by late hours of work or recreation, not retiring until near midnight. But in such cases, a double reform is needed, and so there can be no apology offered for this reprehensible practice on any physiological grounds.

Too Many Varieties of Food.—Many dyspepsias arise from the eating of too many kinds of food at the same meal, another growing custom in modern times which deserves to be distinctly condemned. At great dinners in honor of distinguished personages, when friends are to be entertained, and in the majority of well-to-do families as a general custom, the eaters are tempted to gluttony by having presented to their palates a great variety of complicated dishes, almost any one of which would be too much for the digestive organs of most inferior animals. On the occasion of the giving of a great dinner to some notable, we have known instances in which more than a hundred dishes were served in

successive courses. Such gormandizing soon breaks down the most vigorous digestive organs, since it adds to the labor of digesting food which is improperly cooked, a larger variety than the digestive juices are capable of bringing into a fit state for absorption. Careful experiments have shown very clearly that different classes of food require a particular quality of digestive juices for their digestion. For instance, a gastric juice that will digest animal food the best, is inferior for the digestion of vegetable food, and *vice versa*. The obvious conclusion to be drawn from this fact is that the simpler the dietary, the more perfectly will the digestive process be performed. For persons whose digestive powers are naturally weak this is a matter of special importance. Such will find it well to avoid eating meat and vegetables together. Meat and grains may be taken together, but not meat and vegetables, by persons of weak digestion, the latter being much more difficult of digestion than either of the others. If the bill of fare taken at a single meal were confined to three or four articles of food, there would be fewer dyspeptics scanning the newspapers for a patent nostrum to "aid digestion." Fruit and vegetables are for many an unwholesome combination.

Hot and Cold Bathing after Meals.—Especial mention should be made of the injury to the digestive organs quite certain to result from taking either a hot or a cold bath soon after eating, as few people are aware of the danger of laying the foundation for years of discomfort in this way. If the bath be a hot one, the stomach will be deprived of the blood necessary to support the rapid secretion of gastric juice for the digestion of the food, by the sudden relaxation of the capillaries and arterioles of the skin, drawing the blood to the surface of the body. A cold bath, on the other hand, or any sudden exposure to cold, may, by causing contraction of the blood-vessels of the surface of the body, cause sudden congestion of the stomach, which is equally fatal to good digestion. Very nearly the same danger exists from the taking of baths just before a meal.

The practice very common among boys and young men, of going into the water in the summer time regardless of the condition of the stomach or of other states of the body, is a bad one. With many it is a very usual practice two or three times a week if not more often, to go at once into the water after the evening meal, not allowing even time for the work of digestion to become established. No bath involving any considerable portion of the body should be taken within two hours of a meal.

Errors in Quantity of Food.—If errors in the manner of taking food are active causes of indigestion, mistakes in quantity are still more potent in this direction. It should be noted, however, that errors of this class are very closely connected with errors in the manner of eating, and in the quality of food taken. It is generally true with physical as well as moral transgression, that one bad habit implies another; and especially is this the case in reference to dietetic errors. A person who eats too fast is likely to eat more than is necessary; and the same is true if too large a variety of food is partaken of, or food rendered exciting and stimulating by seasoning with irritating condiments.

Overeating.—Intemperance in eating is, in our opinion, responsible for a greater amount of evil in the world than intemperance in drinking. We do not fear to make this statement, since we believe it can be clearly shown that intemperate eating is, in the first place, one of the most potent causes of intemperance in drinking, and, secondly, that it is one of the greatest obstacles in the way of the reformation of those who have become victims of alcoholic intemperance.

If we may believe the statements of historians, gluttony is by no means a modern vice. Indeed, there is quite good ground for believing that overeating, while a very general fault, is rarely if ever carried to the enormous excess to which some of the luxurious Roman emperors indulged, as for instance, the Emperor Maximus, who consumed forty pounds of flesh in a day; or Caligula, whose custom was to eat until compelled to desist from having distended his stomach to its utmost capacity, and then taking an emetic to enable him to repeat his gormandizing.

The evil consequences of excess in eating are at first simply imperfect digestion, the overtaxed organs being unable to accomplish the complete digestion of the alimentary mass. In consequence of the delay which occurs, changes take place by which acids are developed which irritate the mucous membrane, together with gases by which the stomach is distended and its muscular walls weakened and partially paralyzed. In course of time, inflammation of the gastric membrane is developed, and permanent dilatation of the stomach occurs.

At first, an individual who overeats will be likely to accumulate flesh quite rapidly; but very soon the digestion becomes so much disturbed that no gain takes place, and, indeed, the patient not infre-

quently becomes considerably emaciated even while daily taking large quantities of food. When the opposite is the case, the blood is filled with crude, imperfectly elaborated material, which, when assimilated, produces a poor quality of tissue.

Eating too Little.—A far less common fault than that last mentioned, is eating too little. The instances that occur are usually in the cases of those who have attempted to subject themselves to a rigid dietetic regimen for the prevention or cure of disease, and who, from having only a partial view of the subject, entertain extreme notions. By the weakening of the system which necessarily occurs when an insufficient amount of nutriment is received, the stomach also becomes weak and debilitated, its secretions and muscular efforts being greatly impaired in both quantity and quality. This is well seen in persons who have been long deprived of food. When allowed to eat, they are unable to digest but the smallest quantity of food; and though the system is famishing for nourishment, an amount of food equal to that taken at an ordinary meal would be almost as fatal as a dose of strychnia.

How Much Should a Person Eat?—Hundreds of times have we been asked this question; but we have never been able to give any other answer than might be suggested by the common sense of the questioner, without medical assistance. The only reply that can be made to this question is, Just so much as the system needs and the digestive organs can digest. In general, an individual may take as much food as he can digest; but often there are conditions in which he cannot digest as much as he really needs. For instance, when an individual is called upon to exert all his energies of brain and muscle, to strain every nerve to its utmost to compass a certain object of great importance, to cope with an emergency, he may be for the time being quite unable to digest sufficient food to make good the waste that must necessarily occur. He will lose flesh and strength under such circumstances; and often a failure of the appetite at such a crisis indicates the inability of the stomach to digest, from the deficient secretion of gastric juice. It is on this account that persons who are for a time called upon to make great exertions, often break down their digestion. Thinking that they need abundance of nutriment, which is true, they eat as heartily as when required to perform only their ordinary work, not considering their diminished power to digest

and appropriate food, and in a short time find their digestive organs unable to digest well even a small amount of food.

We are satisfied that it is in this way that many lawyers, physicians, and other professional men, break down. If, when called upon to do a large amount of extra work, the individual would lessen the quantity of food eaten, instead of increasing it, he would conserve his vital forces much more than by pursuing the opposite course. When required by the press of business to do extra work, often working for several days in succession with very little sleep, we have been in the habit for several years of limiting the amount of food taken to not more than half the usual allowance, and sometimes to even a less quantity. The result has invariably been all that could be desired; since, although we have often lost several pounds of flesh during an ordeal of this kind, when it is past, and we return to our usual routine of work, we bring back from the effort our digestion intact, and are able to digest the amount of food necessary for recuperation, so that a few days suffice to restore us to our usual weight, and without loss of either strength or time.

It is evident that the diet of each individual must be regulated in quantity according to his occupation. It must also be adapted to his age. A man engaged in severe physical labor, while he really *requires* less food, may be able to *dispose of* more food than one who labors with equal intensity in some mental pursuit. The body is wasted much more rapidly by vigorous brain labor than by physical exercise. Indeed, it is asserted by our best authorities in physiology, that three hours of severe brain labor are equal in exhausting effects upon the system to ten hours of physical labor or muscular effort. It is evident, then, that a man who works his brain constantly for ten or twelve hours a day really needs more food to sustain his strength than a man who employs his muscles for the same length of time. But, as before remarked, the muscle laborer may be able to *dispose of* more food than the brain laborer, though he *needs* less, since his vital forces are not so completely exhausted by his work. In other words, the occupation of the muscle worker being less exhaustive than that of the brain worker, he can overeat with greater impunity than can the latter. Each should eat but the quantity actually required, if he would enjoy the maximum of health and vigor; but for the man whose vital energies are daily exhausted by mental effort, any excess in eating is certain to be most disastrous. We have examples of great

literary men who have been great eaters; but it is a noticeable fact that these persons, in many instances, while celebrated for their productions, often worked very leisurely, their fame being really more justly attributable to brilliant genius than to great application. In several cases, too, as in that of Charles Dickens, who is said to have been a large eater, the hours spent in brain labor were chosen from the best of the day, many hours being spent in physical exercise, by which means the integrity of the digestive organs was maintained much better than would otherwise have been the case. In not a few instances, too, those great literary men who were noted eaters died early, their physical stamina being exhausted by the double draft made upon it. Newton, when engaged in the most severe portion of his wonderful labors in demonstrating the law of gravitation by computations respecting the orbit of the moon, confined himself to a spare diet of bread and water.

The amount of food required by an individual, as already intimated, varies at different periods of life, according to the degree of vital activity. In infancy and childhood, when the vital activities are at their highest degree of intensity, when growth and development are to be maintained in addition to supporting the wastes of the system, the demand for food is greater in proportion to the size of the individual than at any subsequent time. In adult life, when waste and repair are about equally balanced, a sufficient amount is needed to make good the daily loss from the various mental, physical, and other vital activities, which can only be supported at the expense of tissue. Any larger quantity than this is excess.

In old age, when the assimilative powers are weakened by declining years, the amount of food which can be assimilated by the individual is even somewhat less than what is really needed; hence, as age advances, the quantity of food should be gradually diminished. Very many old people break down much sooner than they would otherwise do were they more careful in this regard. When they lay aside their vigorous, active life, they should also curtail the quantity of their food. By this act of temperance, they might preserve intact to a much later period the integrity of their digestive organs, and so add years to their lives.

In not a few instances, the foundation of dyspepsia is laid by some mechanical injury, as a sprained ankle, a broken limb, or a severe bruise or cut, which requires rest from active exercise for a few

weeks. Not considering the fact that much less food is demanded when an individual is not engaged in active labor of any sort than at other times, the individual continues to eat heartily, and soon finds, that, from sheer exhaustion, the digestive organs refuse to do their work. On this account it should be made a uniform custom to eat lightly on the weekly rest-day. The hearty Sunday dinners in which many people indulge, making the day an occasion of feasting rather than a rest-day, cannot be too much condemned. The custom is without doubt responsible for many other forms of Sabbath-breaking, as no individual can have a clear perception of right and a quick sense of wrong when laboring under the incubus of an overloaded stomach. For the hearty meal usually taken, it would be well to substitute a light one consisting mostly of fruits and grains. This plan, if pursued, would do away with much of the drowsiness in church, of which many people and not a few pastors have abundant reason to complain. The intellect would be much clearer, and so better able to appreciate the privileges and comforts of religion. The sooner people recognize the fact that stomachs have much to do with religion, and that true religion includes the government of the appetite, and frowns upon abuse of the stomach as well as upon abuse of a fellow-man, the better it will be for both their stomachs and their religion. We are not sure but that many gloomy theological dogmas were born of bad stomachs and inactive livers; and we are very certain that one of the best preliminary steps toward converting a sinner is to reform his stomach.

Each individual must be to a considerable extent his own guide respecting the exact amount of food to be taken at a single meal. If the appetite has been so long abused that it is no longer a safe guide, then reason must rule. The individual should, at the beginning of the meal, determine just how much he will eat, and when the specified quantity is taken, he must resolutely stop eating, leaving the table if necessary, to escape temptation. The practice of serving fruit, puddings, nuts, confectionery, and tidbits of various kinds, as "dessert," is a pernicious one. In the first place, it is an inducement to overeat, since it is quite probable that enough has been eaten before the dessert is served. If the articles offered are wholesome, they should be served and eaten with the meal, as a part of it, and not at its close, in addition to the meal. Furthermore, it is generally the case that most of the articles served at dessert are wholly unfit to

be eaten at any time, and so should be discarded. Dessert is really an ingenious device to induce people to make dyspeptics of themselves by eating more than they need.

A man who desires to be at peace with his stomach should learn to "stop when he has enough," no matter how strongly he may be tempted to do otherwise. There is much more truth than poetry in the old Scandinavian proverb, "Oxen know when to go home from grazing; but a fool never knows his stomach's measure." But experience, a dear school, ought after a time to teach the most unobserving person the amount of food his stomach will bear without discomfort, and without injury. If a person in fair health finds that after eating of wholesome food, he is troubled with fullness of the stomach, dullness over the eyes, "sour-stomach," eructations, or flatulence, he may be very sure that he is eating too much, and he should continue to diminish the amount taken at each meal until the symptoms mentioned disappear.

By reference to the table opposite page 370, it will be possible to ascertain with ease the amount of nutriment consumed in any given quantity of different varieties of food. It is worthy of remark that the grains, as shown in the table above mentioned, are by far the most nutritious of all the various classes of food. It will be observed, for instance, that oatmeal, Indian meal, and peas contain three times as much real nutriment as lean beef. When economy must be considered in the selection of food, this is a very important consideration. This becomes doubly evident when we consider that it takes eleven pounds of vegetable food, including Indian meal, dry hay, etc., to make one of beef. Thus it appears that as nutriment one pound of oatmeal at first-hand is as valuable as thirty or more pounds taken at second-hand, through the medium of beefsteak.

Deficient Food Elements.—While the food may be abundant in gross quantity, it may be deficient in some one or more of the various important elements which go to make up the food. If the food is deficient in farinaceous and fatty elements, the individual will soon show signs of suffering in consequence. A lack of the nitrogenous elements will occasion still more marked effects, the stomach losing its tone and vigor, giving rise to acidity, flatulency, and various associated disturbances. The deficiency of the coarser, innutritious elements of the food, is also very soon felt by diminished activity of the stomach and bowels, both in secretion and in muscular action. Hence the great importance of choosing carefully and judiciously the articles of food to be taken, es-

pecially when a regular dietary is to be followed. Such a selection should be made as will supply to the system all the elements of nutrition in proper quantity. To employ a dietary in which any one of the nutritive elements is deficient, although the quantity of the food may be all that the digestive organs can digest, is as really starvation, and will as certainly occasion the same results ultimately, as total deprivation of food. To attempt to live on white bread and butter and strong tea or coffee, is as certain to impoverish the blood as refraining from eating altogether, the only difference being in the length of time required to bring about the result. Thousands of pale-faced, anæmic, thin-blooded, nerveless, dyspeptic women owe all their troubles to an impoverished diet. Tea drunkenness, in which an individual attempts to subsist on the Chinese herb almost wholly, is a not uncommon thing; and in consequence of its pernicious influence, the sagacious physician not infrequently finds as well marked cases of scurvy among ladies of the higher classes of society as among the poorly fed sailors of the whaling vessel after a long voyage with prolonged confinement to a monotonous saline diet. Young ladies who attempt to exist with little other food than tea, pastry, and confectionery, need not wonder that they grow to be lank and sallow and hollow-eyed dyspeptics. Under such a regimen, the most hardy quadruped would succumb.

Many parents weaken the digestive organs of their little ones for life by feeding them when very young upon such insufficient diet as corn-starch or arrowroot gruel, and similar preparations, and when they become older, upon fine-flour bread. Repeated experiment has shown that a dog will die of starvation in a month when fed upon white or fine-flour bread alone. Fed upon bread made of the whole grain, or graham bread, dogs as well as other animals suffer no deterioration in weight or in strength. The difference between fine flour and graham flour is largely in the proportion of gluten which they contain. Fine flour is made from the innermost portion of the grain, which is almost pure starch, thus excluding the brain, nerve, and muscle nourishing elements which are found chiefly in the portions of the kernel that lie next the outer husk. Whole-wheat flour also contains portions of innutritious matter which, under most conditions, are advantageous, encouraging both secretion and muscular activity of the bowels, and thus preventing constipation, which is often a forerunner of more serious disease of the digestive organs. There are cases in which the coarser portions of the bran are injurious by causing irritation; but these cases do not often occur.

While it is necessary to have all of the elements of the food in proper proportion, it is of first importance that the nitrogenous elements should be sufficient in quantity, even if it should be necessary to take an excess of the farinaceous elements to secure the proper amount, since it is of these elements that the vital portions of the body are formed. By reference to the table given on page 373 it may be ascertained what quantity must be taken of the different kinds of food in order to obtain a sufficient supply of nitrogenous elements.

The Quality of Food.—Man, like other animals, is made of what he eats; hence the German proverb is literally true, that "as a man eateth, so is he," and we may well credit the assertion of an eminent author that the general tendency of thought in any nation may be determined by the character of the national diet. True as this principle is when applied to the body in general, it is especially true as referring to the stomach. No organ is so directly and so profoundly affected by the quality of the food as the stomach.

Bad Cookery.—The real object of cooking is to render the elements of food more digestible. It is intended, indeed, to be a sort of partial preliminary digestion of the food; but the numerous devices of cooks and caterers,—complex compounds and indigestible mixtures,—have so far subverted the original design of the process as to render cooking a means of making food indigestible as often as otherwise. Altogether too little attention is paid to the subject of cookery as a science. In the majority of cases the task of preparing food for the palate—the stomach is seldom thought of—is intrusted to ignorant servant girls or colored cooks who compound mixtures by "the rule of thumb," and without any reference whatever to the physiological wants of the body. We are glad to see a slight indication of reform in this direction in the establishment of schools of cookery in the larger cities, and lectureships on the subject in some of our female seminaries. To become a good cook requires as much native genius and far more practical experience than to become a musician or a school-teacher, or even to enter some of the learned professions. The position of cook ought to be made so respectable and lucrative that it will attract persons of sufficient mental capacity and culture to make the art subservient to the purposes for which it was first employed and designed. A poor cook in a family is a worse enemy to the health, the comfort, and even the morals of the household, than would be a swamp generating malaria a half-mile away, a cesspool fever-nest at the back door, small-pox across the street, or a Chinese Joss-house in the next block.

Fried Food.—Of all dietetic abominations for which bad cookery is responsible, fried dishes are the most pernicious. Meats, fried, fricasseed, or otherwise cooked in fat, fried bread, fried vegetables, doughnuts, griddle-cakes, and all similar combinations of melted fat with other elements of food, are most difficult articles of digestion. None but the most stalwart stomach can master such indigestibles. The gastric juice has little more action upon fats than water. Hence, a portion of meat or other food saturated with fat is as completely protected from the action of the gastric juice as is a foot within a well-oiled boot from the snow and water outside. It is marvelous indeed that any stomach, under any circumstances, can digest such food, and it is far from remarkable that many stomachs after a time rebel.

It is principally for this same reason that "rich" cake, "shortened" pie-crust, and pastry generally, as well as warm bread and butter, so notoriously disagree with weak stomachs, and are the efficient cause in producing disease of the digestive organs. The digestion of the food being interfered with by its covering of fat, fermentation takes place. The changes occasioned in the fat develop in the stomach extremely irritating and injurious acids, which irritate the mucous membrane of the stomach, causing congestion, and sometimes even inflammation.

Uncooked Food.—Raw food, and food which is insufficiently cooked, is a frequent cause of indigestion. This is especially true of uncooked vegetables. Man is naturally a frugivorous animal, and is able to make use of vegetables and many grains as food only by the aid of cookery. The starch of vegetables is much more difficult of digestion than is that of fruits. All starch, in fact, is much easier of digestion if subjected to the action of heat before being eaten. By the action of heat, the starch granules, which consist of the starch proper inclosed in little capsules, are ruptured, and thus the digestive juices can readily come in contact with and digest the starch. When starchy substances are eaten raw, extra work is laid upon the organs of digestion, and indigestion follows. It is for this reason that raw fruit and green vegetables occasion so much disturbance of the stomach and bowels, these immature foods containing large quantities of starch in a very indigestible state. By cooking, unripe fruit and vegetables may be in a great degree deprived of their injurious properties. In Scotland, the eating of oatmeal imperfectly cooked is a very common

practice, the result of which is an almost universal suffering from a peculiar form of indigestion due to it. Nearly all kinds of food are much more easy of digestion after cooking than before, providing the cooking is performed in the proper manner. For vegetables and grains, cooking is especially necessary.

Decayed Food.—Much harm comes from eating food which has made appreciable advancement in the direction of decay. This is true of both vegetable and animal food. By the process of decomposition, poisonous elements are developed in animal and vegetable substances which do not naturally exist there. If decomposition is far advanced, these poisons may exist in such quantity as to produce immediate ill effects, sometimes occasioning death in a few hours. Instances of this sort have often occurred from eating canned meats which had spoiled, or which had been kept for a short time after opening. The practice in vogue in some countries, and to some extent in this, of keeping meat for some days before eating, so as to give it tenderness and a "high" flavor, is a most pernicious one. Better far, for health, is the horrible Abyssinian custom of eating the flesh while still warm and quivering.

For persons with slow digestion, such food is especially bad, since digestion is so slow that decomposition is not corrected, as it is to some extent in a healthy stomach, by the gastric juice, but is allowed to continue with all its serious consequences. If no immediate effects are seen to follow the use of such food, the poisons generated may be absorbed and appear in some later form analogous to blood poisoning. The stomach of a hyena may be able to digest the putrid flesh of a decaying carcass ; but man's stomach was not intended for scavenger use, and requires fresh, untainted food.

Soft Food.—The structure of man's teeth indicates that he was intended to employ a diet consisting of food with sufficient consistency to require vigorous mastication. His jaws are armed with thirty-two strong teeth, compactly arranged in his mouth in such a manner as to make them most available for use. Obeying the general law governing all organized structures, by which organs develop or degenerate according as they are used or allowed to remain inactive, the teeth retain their health if vigorously employed in the mastication of solid food, but rapidly undergo decay when not thus used. This is well seen in cows which are fed on "distillery slops." The teeth of such animals decay and drop out for want of use, while those of cattle which keep their teeth actively employed in chewing the cud, are preserved intact. The same is true of

human beings. Eating soups, gruels, and other soft food, to the exclusion of articles requiring mastication, ruins the teeth at the same time that it disorders the stomach through the taking of too much fluid, and deficient insalivation.

Too Abundant Use of Fats.—Unfortunately for the poor stomach, the opinion prevails almost everywhere that food made "rich" with fat is the most nourishing. Undoubtedly, fat is an element of nutrition, and can be digested and assimilated when taken in proper quantities and in a proper manner; but the excessive use of fats of various kinds—lard, suet, butter, and other animal and vegetable fats or oils—is a prolific cause of certain forms of indigestion, especially that known as bilious dyspepsia. Eminent physiologists determined by careful experiment, many years ago, the fact that the large use of fats greatly lessens the biliary secretion, the quantity of bile being diminished in some instances to a very small fraction of the amount secreted when only pure water or food containing little fat was taken. When it is remembered that the bile is an essential element for the digestion of fat, it will be seen that a diminution of this digestive fluid, in connection with the taking of an extra quantity of oleaginous matter, is a most unfortunate circumstance, since it is thus absent when most needed. This fact is sufficient to account for the distressing symptoms which accompany the excessive use of fats by those whose digestion has been already weakened by abuse of this sort. The diminished quantity of bile eliminated by the liver is also sufficient cause for the condition established by the overuse of fats, vulgarly known by the expressive term, "bilious." The elements which ought to be eliminated from the system are retained, clogging the vital machinery, and giving rise to the many unpleasant symptoms enumerated hereafter in describing "bilious dyspepsia."

If fats are to be used at all, it is much preferable to employ them cold, as butter taken on bread at the table, rather than cooked in the food, by which the fat elements permeate and render difficult of digestion the whole mass of food.

The Use of Sugar in Excess.—While sugar, like fat, is a true alimentary principle, capable of aiding in the maintenance of life when employed with the other elements of food, used in excess it becomes a serious source of disease. Employed alone, it is utterly incapable of supporting the vital activities of the body, being, in this respect, analogous to starch, its food equivalent. The popular idea that

sugar nourishes the nerves or the brain, makes the teeth sound, and is both harmless and wholesome, is quite a mistake, as many an innocent little one whose fond parents shared in the general error, has found out to the regret and sorrow of his friends.

The different forms of sugar, molasses, sirup, treacle, honey, etc., are essentially the same in their effects, except that molasses and honey sometimes contain peculiar elements which to some persons seem to be almost active poisons. This is especially true of honey.

The injury from the use of sugar or other saccharine substances, is occasioned, first, by the readiness with which it undergoes fermentation when subjected to warmth and moisture. In the stomach it finds all the conditions necessary for inducing fermentation; and were it not that saccharine substances in solution are usually so quickly absorbed that it is difficult for the chemist even to detect their presence in the stomach, this change would always occur. When a larger quantity is taken than can be absorbed promptly, or when taken in such form as to make ready absorption impossible, as in the form of preserves and sweet-meats of various sorts, acid fermentation does occur, and with serious results not only to the stomach, but to the whole system. The fermentation set up not only develops acids and gases from the sugar, but, being communicated to the other elements of the food,—the starch, and especially the fatty elements,—still worse forms of fermentation or decomposition occur, and the food is thus rendered unfit to nourish the body, while the mucous membrane of the stomach and intestines is irritated by the contact of unnatural, corroding elements in the food; and through their absorption, the whole system becomes affected.

The excessive use of sugar also greatly overtaxes the liver, which has an important part to act in its digestion, distracting it from its legitimate function, and thus leaving the elements which it ought to eliminate, to accumulate in the system. Thus an individual may become "bilious" from the overuse of sugar as well as from excess in the use of fats.

Condiments.—By condiments are meant all substances added to food for the mere purpose of rendering it more palatable, though possessing no positive nutritive value in themselves. Mustard, vinegar, pepper, cinnamon, and various other spices, are included in this category, together with salt, although the last-named article is by some held to be of the nature of a food, supposing it to supply some want in the body.

Mustard, pepper, pepper-sauce, cinnamon, cloves, cardamoms, and similar substances, are of an irritating, stimulating character, and work a twofold injury upon the stomach. By contact, they irritate the mucous membrane, causing congestion and diminished secretion of gastric juice when taken in any but quite small quantities. This fact was demonstrated by the observations of Dr. Beaumont upon St. Martin. After several years' careful study of the relations of various foods, drinks, etc., to the stomach, Dr. Beaumont stated in summing up his experiments that "stimulating condiments are injurious to the healthy stomach." He often saw congestion produced in the mucous membrane of St. Martin's stomach by eating food containing mustard, pepper, and similar condiments.

When taken in quantities so small as to occasion no considerable irritation of the mucous membrane, condiments may still work injury by their stimulating effects, when long continued. The stomach, being at first excited to more than natural activity, afterward suffers from reaction, and is left in an inactive, diseased state, incapable of secreting sufficient gastric juice to supply the needs of the system in digesting food. This final result is often averted for some time by increasing the quantity of the artificial stimulus, in the form of pepper, mustard, salt, etc., but nature gives way at last, and chronic disease is the result.

In the case of salt, there are several further objections to be urged, which are at least cogent against its excessive use; and by excessive use we mean a quantity which causes thirst either at or after meals, occasioned by the feverish state of the stomach induced by the caustic properties of the saline element.

1. Salt is an antiseptic. As already seen, anything which prevents fermentation will interfere with the action of the gastric juice. Hence salt, in any except very small quantities, must materially interfere with digestion.

2. It is an irritant, not only to the stomach but to other parts of the system as well, as is indicated by the quickened pulse, thirst, and other symptoms of a febrile character experienced by a person after taking a slightly larger quantity than usual.

3. Being a purely mineral substance, in no degree prepared, by association with organized life in plants, for assimilation as is necessary in the case of all mineral substances, it is exceedingly doubtful whether it is a food in the sense that fruit, vegetables, grains, or their

several nutritive elements, are foods, and whether it can be assimilated or made to take part in the vital processes of the body in any way in larger quantities than it is found in food.

4. Experimental evidence shows that human beings, as well as animals of all classes, live and thrive as well without salt as with it, other conditions being equally favorable. This statement is made with a full knowledge of counter arguments and experiments, but with abundant testimony to support the position taken.

Experiments made in the Laboratory of Hygiene connected with the Battle Creek Sanitarium, confirm the observations of German physiologists to the effect that salt hinders the digestion of albumin. This it does by interfering with the secretion of gastric juice. Investigation has shown that all condiments hinder natural digestion.

Salted food is generally known to be very hard of digestion, and when it is taken for a long time, the stomach often fails. A piece of fresh fish which will digest well in one hour and a half, requires four hours after salting, according to Dr. Beaumont.

We may, in conclusion, remark that though we do not, except in rare instances, advise the entire discontinuance of the use of salt, on account of its having been so long employed as an ingredient of food, we believe that it may be greatly reduced in quantity by all who use it, without detriment, and with real benefit.

Pickles.—Cucumbers, peaches, green tomatoes, and numerous other fruits and vegetables, are sometimes preserved by saturation with strong vinegar. Sometimes whisky or some other alcoholic liquor is added to increase the preservative property of vinegar. The same process which makes it impossible for a fruit or vegetable to ferment or decay, makes its digestion equally difficult, as already explained. Pickles are exceedingly unwholesome as articles of food, and often cause acute dyspepsia in those who eat of them. Young ladies addicted to the free use of pickles may be assured that they must certainly part with their favorite dainty or bid farewell to good digestion. Cucumbers preserved with salt or vinegar are next to impossible of digestion. The proverbial unhealthfulness of this vegetable is a popular notion based on experience with the article prepared with vinegar and salt. Those chemical agents harden the delicate structures of the vegetable, and render it almost unapproachable by the digestive juices. The pure vegetable, unsophisticated by condiments, is as harmless as other green vegetables. We would not hesitate to eat it freely thus, if need be, and in "cholera times."

Vinegar.—As the use of vinegar is continually increasing, attention should be called to the fact that it may be a cause of disease. Ordinary vinegar contains about five per cent of acetic acid, its principal ingredient. Like alcoholic liquors, vinegar is a product of fermentation, being the result of carrying a little farther the same process by which alcohol is produced. Vinegar is much more irritating to the digestive organs than an alcoholic liquor of the same strength. It is extremely debilitating to the stomach when much used, though for the time being exciting. Vinegar is not infrequently employed in considerable quantities by young ladies who are anxious to look pale and interesting, and it never fails to produce the desired effect. It can be well recommended for such a purpose, since it so greatly impairs the digestion as to soon interfere seriously with nutrition. The moderate use of a light wine or of ale or beer is much less destructive to the digestive organs than the large use of vinegar which is not uncommon among hearty eaters. There is really no need of resorting to so inferior a source for a mild acid, as we have the want met most perfectly in lemons, limes, citrons, and other acid fruits. As a dressing for some kinds of vegetable food, lemon juice is a perfect substitute for vinegar.

We have maintained this position respecting the use of vinegar for several years, notwithstanding it has been highly recommended by not a few eminent writers on food and dietetics. Very recently, however, M. Richet, at the head of an august body of French savants, comes forward maintaining that by careful experiment he has proved that these things are "bad food for the stomach." He does not hesitate to pronounce vinegar and tartaric acid prolific causes of dyspepsia, and highly condemns the use of vinegar and pickles by young ladies. It is no wonder that young ladies who indulge in these unwholesome articles of food grow "pale and interesting" with dyspepsia. According to Sir Wm. Robert, also, vinegar, even in small quantity, completely prevents the action of the saliva upon starch.

Tea and Coffee.—In classing these favorite beverages with causes of dyspepsia, we shall certainly call forth a loud protest from the numerous devotees of "the fragrant cup;" and among the number of those who argue for their use we shall find numerous learned professors, as well as nearly the whole sisterhood of the wives, maidens, mothers, and grandmothers of the nation, along with a good proportion of the husbands, fathers, brothers, and grandfathers as well. Nevertheless, it can

be easily shown that whatever action may be assigned to these beverages, it is unfavorable to digestion, rather than otherwise. Leaving out of consideration the objections which may be urged against the use of tea and coffee on other grounds, the following may be offered as reasons why they are objectionable on account of exerting an injurious influence upon the digestive organs:—

1. Both tea and coffee contain an element resembling tannin, which precipitates or neutralizes the pepsin of the gastric juice, and so weakens its digestive power.

2. Theine and caffeine, the active principles of tea and coffee, are toxic elements which at first increase and then diminish vital action, thus occasioning debility of the digestive organs from long-continued use.

3. Both tea and coffee are objectionable on the same ground as other beverages in connection with meals, on account of disturbing the digestion by dilution and consequent weakening of the gastric juice, and overtaxing the absorbents, delaying the digestion of the food and thus giving rise to fermentation. When taken hot, as is the usual custom, these beverages, as do others, at first stimulate but ultimately relax and debilitate the stomach.

The objections mentioned as applying to tea and coffee may be urged with equal force against cocoa and chocolate, the effects of which differ from the effects of tea and coffee chiefly in degree.

For the other injurious effects of tea and coffee, see chapter on "Stimulants and Narcotics."

Alcohol.—We have not space in this connection to dwell at length upon the damaging effects of alcohol upon the human system, nor in full detail of its effects upon the stomach. The following facts, however, are well worth the consideration of those who believe in the use of alcohol either moderately or with greater freedom:—

1. Alcohol itself is an active poison, which when received into the stomach in a concentrated state is almost as quickly fatal to life as is prussic acid or strychnia. It precipitates the pepsin of the gastric juice, rendering it inert.

2. It irritates the gastric mucous membrane when taken in any but extremely small quantities, even beer and the weaker liquors having this effect when long continued.

3. The ultimate effect of alcohol is to cause degeneration of the secreting glands of the stomach, by which its utility as a digestive organ is destroyed.

Dr. Beaumont's observations on the effects of alcohol are very positive and distinct in their indications. St. Martin being an intemperate man, occasionally indulging freely in drink, Dr. Beaumont had an opportunity of observing the effects of its use, as he was able to look directly into his stomach by the aid of a strong light, through the window provided by the remarkable accident from which he had suffered. After he had been drinking freely for several days, Dr. Beaumont found the mucous membrane exhibiting inflamed and ulcerous patches, and the secretions very greatly vitiated, the gastric juice being diminished in quantity, viscid and unhealthy, although St. Martin did not complain of any unusual feelings, his appetite being apparently unimpaired. The condition became still more aggravated for two days, when the Doctor found that "the inner membrane of the stomach was exceedingly morbid, the erythematic appearance more extensive, and the spots still more livid. From the surface of some of them exuded small drops of grumous blood; the aphthous patches were large and very numerous, the mucous covering thicker than common, and the gastric secretions very greatly vitiated. The gastric fluids extracted were mixed with a large proportion of thick, ropy mucus, and a considerable muco-purulent discharge slightly tinged with blood, resembling the discharge from the bowels in some cases of dysentery."

It will be remarked that notwithstanding the very serious condition of his stomach, St. Martin was unconscious of any great disturbance there. This was partly due, no doubt, to the paralyzing effect of alcohol upon the nerves of sensibility. It is owing to this fact that so many suppose that alcoholic drinks have no specially bad influence upon the stomach, when really their stomachs are well-nigh useless from disease but too insensible to indicate their condition.

Liquor of any sort taken upon an empty stomach is especially injurious.

Tobacco.—Not infrequently, though less often than is the case with alcoholic liquors, this narcotic drug is recommended as a remedy for dyspepsia. Nevertheless, in the case of tobacco as in that of alcohol, the remedy suggested is itself an active cause of stomach disease. Only on the *similia similibus* plan could either one be reasonably employed. Both smoking and chewing weaken and debilitate the digestive organs, though both of these practices are thought by those who indulge them to stimulate the process of digestion, which they probably do for the time being but only at the expense of subsequent injury. Snuff-taking, especially,

produces gastric irritability, probably by reflex sympathy of the mucous membrane of the stomach with that of the nasal cavity, which is irritated by the direct contact of the acrid drug.

The immense waste of saliva occasioned by chewing and smoking may fairly be considered as one of the means by which the system sustains loss and injury through the use of tobacco. Those who chew or smoke to prevent excess of fat, should understand that any drug which will exert such an influence upon the system must be a powerfully destructive agent. Those who succeed in keeping down fat by the use of tobacco may depend upon it that they are doing so only at the ruinous expense of their digestive organs, and may look forward with certainty to the breaking down of their nervous systems.

Hard Water.—So little attention has been paid to this really common cause of indigestion by writers on this subject, that we cannot forbear mentioning it here. Experience has often proved that the use of hard water impairs the integrity of the stomach sooner or later when long continued; and in numerous instances its effects are almost immediate upon persons who visit a hard-water district, having been accustomed to the use of soft water. These injurious effects are undoubtedly attributable to the lime and magnesia which are contained in water called hard. These alkalies, as already seen in considering the physiology of digestion, neutralize the gastric juice, and thus work their mischief. There is little necessity for the use of hard water in any part of the country. Where there are not soft-water wells or springs, rain-water may be caught and preserved in cisterns, and by filtration through carbon filters it can be made pure and palatable for drinking and cooking purposes. There is no foundation for the theory that hard water is in any respect more excellent for use than pure soft water.

Alkalies.—Soda, saleratus, and the numerous compounds of these substances with ammonia, alum, cream of tartar, etc., are all objectionable on the same grounds as hard water. Being alkaline, they antagonize the action of the acid gastric juice, and thus weaken digestion. There is no more active dyspepsia-producing agent than soda and saleratus biscuit, one of the most common articles of food to be found on the tea-table of rich and poor in this country. Doubtless, well-prepared baking-powders are much preferable to soda and cream of tartar or saleratus and sour milk, mixed by the cook in accordance with the not remarkably accurate "rule

of thumb," through which bungling chemistry the biscuits often present a golden hue which may be attractive to the eye, but gives to the tongue quite too distinct a flavor of soda and potash to be agreeable to a fastidious taste, to say nothing of the probable effect upon a stomach not impregnable against the attacks of chemical agents. In baking-powders, the various ingredients are so mixed as to leave nearly neutral products, and yet these compounds are scarcely less pernicious in their influence upon digestion than the original chemicals from which they are formed. We deem the widespread and growing use of these chemical bread-making agents bad omens for the digestion of the next generation; though we readily grant that if the alternative is between heavy bread and bread made "light" with baking-powder, the latter is preferable.

Perverted Appetites.—Strangely perverted tastes, as shown in a fondness for earthy and other inorganic or innutritious substances, while sometimes the result of dyspepsia, are often the cause of stomach disorders, being the result of nervous or mental disease, or being adopted as a habit through example. In South America there are whole tribes of human beings who habitually eat considerable quantities of a peculiar kind of clay. Several North American tribes have the same habit, being known as clay-eaters. A similar propensity sometimes appears among more civilized human beings, being almost exclusively confined, however, to young women, chiefly school-girls, who acquire the habit of chewing up slate pencils, and gradually become so fond of such earthy substances that they have in some instances been known to eat very considerable quantities of chalk, clay, and similar substances. While indicating a depraved state of the system, and often of the mind also, this practice has a very pernicious effect upon the stomach, which is not intended, as is that of the fowl, to receive inorganic matter of that sort.

The amount of abuse of this sort which the stomach will stand, however, is quite astonishing. Dr. Pavy tells a story of an American sailor who saw a juggler pretending to swallow pocket-knives. With the characteristic recklessness of a sailor, and supposing that the knives were really swallowed, he attempted to do the same thing himself, and succeeded in getting down four. Three of these were passed off in two days, but he never saw the other. Six years after, he swallowed fourteen knives in two days, and was taken to a hospital, where "he got safely delivered of his cargo." He was not so

fortunate on a subsequent occasion, when he paid dearly for his folly, lingering in misery for some time until he died, when his stomach was found to contain a number of rusty knife-handles, blades, springs, etc., being greatly contracted and corrugated in consequence of the violence which had been done to it.

The habit of swallowing cherry pits, apple and other small seeds, is a very reprehensible one. Such objects not only disturb the stomach, but sometimes find lodgment in the appendix at the lower end of the cœcum, giving rise to inflammation and death. As a general rule, the innutritious parts of foods, as the skins of fruits and vegetables, the seeds and cores of apples, and similar parts, should be carefully separated from the nutrient portions and discarded.

Adulterations of Food.—The numerous adulterations of food which are now so extensively practiced must be recognized as a not unimportant cause of functional disease of the stomach. Alum in bread and in baking-powders; lead in drinking-water which has passed through lead water-pipes, or has been stored in lead cisterns, or collected from a roof covered with sheet-tin containing lead; lead in the tin cans used for preserving fruit, or in basins, tin pans, or other tinned ware, or in the glazing of kettles; vinegar containing sulphuric and other strong mineral acids; pickles boiled in copper or brass vessels and thus poisoned with copper; sugar adulterated with glucose—or sugar made from corn, refuse starch, etc.—and containing iron, sulphuric acid, tin, etc.; flavoring extracts made by purely chemical processes, and containing not a drop of the extract of the fruit after which they are named; chalk and water in milk,—these, with numerous other equally harmful adulterations, work havoc with the stomachs of people who are so unfortunate as to be victimized.

Unseasonable Diet.—The failure to recognize the necessity of adapting the diet to the season and climate is a prolific source of a certain class of dyspeptic disorders. This is especially noticeable when the use of large quantities of carbonaceous food, especially fats and sugar, which may be used in the winter with comparative impunity, is continued into the warm season of the year, or when a diet of this sort is continued in a warm climate by persons who have been accustomed to it in a cold country. It is this sort of transgression of the laws of digestion that gives rise to "biliousness," "bilious dyspepsia," etc., in many persons. Large quantities of fat and sugar are not well tolerated by the stomach at any time; and in warm climates,

and the warm season of cold and temperate latitudes, they are exceedingly injurious.

Pressure upon the Stomach.—The stomach is remarkably sensitive to pressure. It even sometimes becomes temporarily paralyzed by excess in eating, or by the accumulation of gas from fermentation, by the distension of its walls. It is equally liable to injury of a similar sort from external causes. A sudden blow upon the stomach has been known to produce almost instant death. In ladies, the wearing of corsets, and tight-lacing with or without the corset, are common causes of dyspepsia as well as of other serious diseases. Wearing of the pantaloons drawn tightly, and without suspenders, has a similar effect in men. The soldiers of the Russian army once suffered so much from this cause that it became necessary to correct the evil by a royal edict for the purpose. Very soon after the evil practice was discontinued, the effects disappeared. Book-keepers and school children from sitting at a desk, seamstresses and tailors from stooping over at their work, shoe-makers, weavers, and washer-women, from direct pressure upon the stomach incidental to their work, suffer from disturbance of that organ.

Drugs.—The continued use of drugs of several sorts, and especially of patent medicines, "bitters," and "purgatives," particularly the latter, has a very damaging effect upon the stomach and bowels. Too much cannot be said to discourage the use of laxatives, purgatives, "liver pills," etc. While sometimes beneficial, agents of this sort, if used for any length of time, are quite certain to work mischief. Purgatives should never be used except as temporary palliatives. If the bowels require artificial aid, the enema is far preferable; and yet this plan also has its inconveniences, and results badly if too long continued. In general, the less drugs one takes the better. Patent nostrums should be shunned as the most virulent poisons, which in many instances they are.

Neglect of the Bowels.—Neglecting to heed the calls of nature promptly and regularly is an abuse of the digestive organs which should not be overlooked. The bowels are as much a part of the alimentary canal as is the stomach; and they have an important part to act in absorbing the digested food. They are also important excreting organs, some of the worst poisons generated in the system passing off through them. The feces are made up, not chiefly of the remains of food, as many persons suppose, but of impurities thrown out of the

system by the intestinal mucous membrane. When these excrementitious substances, the foulest in the body, are retained, they are to some extent reabsorbed, thus poisoning the system. Every physician is familiar with the peculiar fecal odor of the breath of a costive child, an evidence of the absorption referred to.

The bowels naturally move once a day with most people, and commonly soon after breakfast. A few persons habitually move their bowels only every other day, without injury, while some persons find it necessary to relieve the bowels twice in twenty-four hours. However the habit may be, it should be regular. Every person should have a definite time for attending to the relief of the bowels as systematically and punctually as in taking meals. This is a matter of very great importance; piles, or hemorrhoids, fissure and fistula, prolapsus of rectum and also of the womb, and a host of other evils, begin in constipation of the bowels.

To encourage the needed regularity and promptness in attending to the bowels, it is important that comfortable accommodations for the purpose should be provided. The custom of building a small, loose shed at a considerable distance from the house is a bad one, as it subjects women and children, especially, to unpleasant and even dangerous exposure during the cold months of the year. Still more to be deprecated is the custom, quite prevalent in the West, of dispensing with privy accommodations altogether. The closet should be near the house, and should be made warm and convenient, and properly screened. If judiciously taken care of, it need not be a nuisance or a cause of disease, even if adjoining the house or within it. The earth-closet plan is an excellent arrangement for winter.

A very eminent medical gentleman, a man of long experience as a specialist in the treatment of diseases of women, affirms his belief that not a few of the serious maladies from which women suffer are due to neglect of the bowels.

The best remedies for constipation are given under the proper head.

Mental Influence.—The digestive process is very greatly under control of the mind. The connection between the mind and the stomach is so intimate that Van Helmont maintained for a long time that the stomach was the seat of the soul. By any strong emotion the whole digestive apparatus may suddenly cease to act. Fear, rage, and grief check the salivary secretion, and without doubt the gastric

also. Through the mind, the appetite may be either encouraged or quite destroyed.

A man who sits down to his dinner with his mind depressed with business cares, the embarrassment of debts, or the anxiety of doubtful speculations, cannot hope to digest the most carefully selected meal. The woman who dines with her mind disturbed with discontent, fretfulness, and worriment, is certain to suffer with indigestion. Domestic infelicity may well be counted as at least an occasional cause of digestive derangements. Meals eaten in moody silence are much more apt to disagree with the stomach than those which are accompanied by cheerful conversation. A hearty laugh is the very best sort of condiment. Cheerfulness during and after meals cannot be too highly rated as an antidote for indigestion.

Hygiene of the Teeth.—Defective teeth, by interfering with the complete and thorough mastication of food, seriously impair the digestion. On the other hand, impairment of digestion and pervertion of the secretions, is a very common cause of decay of the teeth. Thorough mastication is essential to good digestion; and no one can hope to preserve a good digestion while munching food with toothless gums, or subsisting on a dietary that requires no use of teeth.

So rapid is the increase of degeneration of the teeth in modern times, that we have asked ourselves more than once the question, Will the American race become toothless? Not quite, perhaps; at least not so long as artificial dentures can be manufactured from such a variety of substances, and made to answer so useful a purpose as masticators. Indeed, some people already afford two sets of teeth—a set for every day, for rough usage, and an extra-fine set for exhibition on special occasions. But at the present rate of deterioration, not many more generations will appear before we shall find a toothless race, shipwrecked in health, with digestion bankrupt, and "nerves" the dominant feature.

Rarely, indeed, do we find a person at thirty years of age with a set of sound teeth. Far more often do we find young lads and girls of ten to sixteen years of age whose teeth are mere shells of decaying tissue, rotting away with almost visible rapidity, depositories of decaying particles of food, and millions of wriggling animalcules, and the sources of contaminating elements which deteriorate digestion, and of offensive odors which contaminate the breath. In confirmation of these statements respecting the condition of American masticators,

it may be mentioned that there are 12,000 dentists in the United States, who annually extract twenty million teeth, manufacture and insert three million artificial teeth, and hide away in the cavities of carious teeth three tons of pure gold, to say nothing about the tons of mercury, tin, and other metals employed in "fillings."

For the preservation of the teeth we offer the following rules, which, if thoroughly carried out, will certainly secure good results unless the teeth are ruined by incurable constitutional disease:—

1. See that the teeth are properly developed. To this end, supply the child while an infant, and ever after, with an abundance of food which is rich in "salts," such as peas, beans, graham bread, oatmeal, and the like, and carefully watch the first set of teeth as they are developed and give place to the permanent set.

2. Have a tooth filled as soon as the smallest appearance of decay is discovered; and in order to discover the very beginnings of decay, examine them frequently, or have a dentist do so. If a child complains of toothache, take him to a good dentist at once, for something is certainly wrong. It is a mistake to suppose that it is not worth while to have first teeth filled, since others will come in their place. Unless the tooth is about to be displaced by the permanent tooth, it should be filled, for the benefit of the coming permanent tooth as well as for the present health and comfort of the child.

3. Cleanse the teeth night and morning, as well as after each meal, taking care to remove all particles of food, brushing and rinsing well. Use soap and powder at least once a day. Give attention to the back teeth, and the inside as well as the front of the teeth. It is especially important to give attention to the spaces between the teeth.

4. Never allow mineral acids of any kind, nor such preparations as chloride or sulphate of iron, to touch the teeth, as they will destroy the enamel.

5. Avoid allowing gritty substances to come in contact with the enamel, as they will scratch and mar it, and perhaps cause the beginning of decay.

6. If possible, never lose a tooth. An eminent physician once said that we lose a year of life every time we part with a tooth. They are too valuable to lose when by a trifling expense they may be saved.

7. Never employ traveling dentists nor purchase or use patent compounds for the teeth. Many of them contain substances which will destroy the enamel or induce disease of the gums.

8. Never carry "old stumps" in the mouth. If they cannot be filled, have them extracted.

9. If the teeth are utterly in ruins and can in no way be repaired so as to make them really serviceable, they should be replaced by good artificial teeth.

10. Artificial teeth must be cared for with as much scrupulous regularity and thoroughness as natural teeth, in order to preserve the health of the mouth. They should be removed from the mouth at night and placed in a glass of water, and in the morning should be thoroughly cleansed with fine soap or with a solution of chlorinated soda, which can be obtained of any druggist. They should also be removed from the mouth and thoroughly cleansed after each meal.

Decay of the teeth is the most common of all human maladies. In this country (United States), very few persons reach adult age with perfectly sound teeth. Doubtless one great cause of the decay of teeth is the neglect to properly use them, by making the dietary consist too largely of soft food. A considerable portion of each meal should consist of dry, hard food, which requires thorough chewing.

Recent investigations have shown that caries, or decay of the teeth, is the result of the action of germs within the mouth. Certain germs, feeding upon the fragments of food left behind after eating, lodging between the teeth, develop chemical substances which are capable of dissolving the enamel. The softer portion of the tooth is rapidly disintegrated by the action of the various germs which come in contact with it, and thus in a very short time, under favorable conditions, especially in cases in which the stomach is disturbed, whereby the fluids of the mouth are more vitiated, the soundest teeth may become a source of great pain and suffering, and lose their usefulness as an aid to good digestion.

SECRETION AND EXCRETION.

The nutrition or maintenance of the body in health, involves two essential processes, *assimilation* and *disintegration*, or *dis-assimilation*. *Assimilation* is the process by which the nutritive material furnished to the tissues in the blood is made into tissue, each tissue possessing the power to renew itself from the elements found in the blood. *Dis-assimilation* is the process of tissue waste or breaking down. Every act, thought, sensation, no matter how slight, results in the waste or breaking down of tissue. As accessory to these two great processes, we have *secretion* and *excretion*. *Secretion* is the formation from the blood of something which did not exist in it, but which is produced by transformation of some of the elements which it contains, for the purpose of aiding in some vital process. Assimilation is really a secretory process, each tissue possessing the power to secrete tissue like itself. *Excretion* is the removing from the blood of the products of tissue waste which are washed out of the tissues by the venous blood.

Secretions.—The principal secretions are the following: 1. The digestive fluids, comprising the *saliva, gastric juice, bile, pancreatic juice,* and the *intestinal juices,* all of which have been described; 2. *Serous fluids,* produced by serous membranes for the purpose of lubrication; as by the peritoneum, which lines the abdominal cavity and covers the intestines; the pericardium, which incloses the heart; the pleura, which covers the lungs and lines the chest; the membranes of the brain, etc.; 3. *Synovial fluid,* which is formed by the synovial membranes of joints for the purpose of lubrication; 4. *Sebaceous matter,* which is formed by minute glands in the skin and some parts of the mucous membrane for the purpose of protecting the skin, and keeping it in a supple condition; 5. Various other fluids formed by small glands which are imperfectly understood, as the pineal gland and pituitary body of the brain.

Excretions.—The principal excretory products are the *sweat, mucus, urine, bile,* and *carbonic acid,* eliminated respectively by the skin, the mucous membrane, the kidneys, the liver, and the lungs. The excretions are not produced by the organs named, but by the tissues, the

organs mentioned simply serving to separate the various morbid elements from the blood.

Without going into the minute details of the subject, we will now consider the structure and functions of the principal secreting and excreting organs which have not been already described.

The Skin.—The general structure of the skin has been described in connection with the consideration of the sense of touch (see page 167), and hence we need consider here only the points there omitted; viz., the secreting and excreting organs of the skin, and the hair and nails. A reference to PLATE IV. will give quite a clear idea of the relations of the sweat glands, the hair, and the sebaceous glands, to the general framework of the skin. The area of the skin in an adult is twelve to sixteen square feet.

The Sweat Glands.—A close examination of the little ridges found upon the palms of the hands, by the aid of a small magnifying-glass, will reveal what appear to be fine transverse lines crossing the ridges at short intervals. A closer inspection shows that the apparent lines are really extremely minute openings, guarded by delicate valves. These are the mouths of the perspiratory ducts, which convey to the surface the product of the sweat glands. The gland itself is merely a coiled tube, situated deep down in the true skin, and surrounded with a net-work of blood-vessels. The duct is simply a continuation of the same tube upward through the cuticle to the surface. It passes out upon the surface of the skin obliquely, thus leaving a small portion of the cuticle overlapping its orifice, forming a sort of valve.

The number of these delicate glands is enormous. It has been carefully estimated to be about 2,300,000 in a single individual. The length of each is about one-fifteenth of an inch, making their aggregate length about two and one-half miles.

Between two and three pounds of sweat are thrown off each day. The perspiratory secretion consists of water holding in solution various excretory principles, the chief of which is urea, which is also eliminated by the kidneys, and is one of the most important excretory products. The amount of urea varies somewhat with the amount eliminated by the kidneys. The sweat also contains a large proportion of chloride of sodium. In certain parts of the body, particularly the armpits and between the toes, the sweat glands are more numerous than in most other parts, and the perspiration often has a peculiar and offensive

odor. The sweat secretion is usually acid; but when so strongly odorous, it is found to be alkaline.

The Hair.— With the exception of the palms of the hands and the soles of the feet, the whole surface of the body is covered with hairs, which vary much in length and thickness in different parts of the body. The majority are soft and fine, those upon the head and a few other parts of the body being long and silky. The hairs found upon the head average about $\frac{1}{400}$ of an inch in diameter, varying from $\frac{1}{140}$ to $\frac{1}{1500}$ of an inch. Dark hair is usually coarser than light. The color of the hair is due to pigment of the same nature as that which gives color to the eye and skin. The number of hairs upon the entire head is about 120,000. Straight hairs are nearly round. That which is curled is elliptical. The hair of the negro is flat. Hair possesses the peculiar property of becoming strongly electric when rubbed. This is especially manifested in cold, dry weather. When combed in the dark, sparks may be seen to issue from it. This may be well seen in rubbing the back of a cat, stroking toward the head.

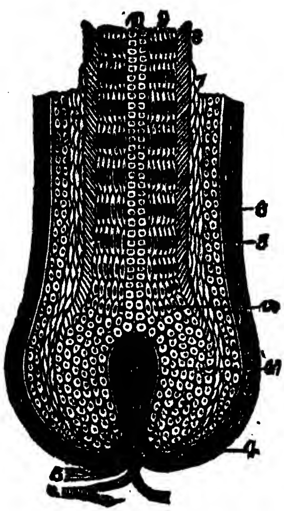


Fig. 130. The Root of a Hair, showing nutrient blood-vessels at the base.

Most hairs are hollow, being really hollow tubes, the outside being covered with a layer of overlapping cells. When viewed with a microscope, the hair looks rough and serrated. This peculiarity can be demonstrated by a simple experiment. Place two hairs between the thumb and finger with the roots the same way. Now make a slight side movement with the thumb and finger, thus rubbing the hairs alternately in different directions. Two smooth wires so treated would remain in the position in which they were placed; but the hairs will be seen to move with each alternate movement of the fingers, and always toward the root. Now if one hair be changed so that its root is in the same direction as the tip of the other, the same rubbing will cause them to move in opposite directions.

The hairs grow from little pouches in the skin. The root of a hair greatly magnified is shown in Fig. 130. The hair serves a useful purpose in

protecting the body, giving additional warmth in some places, and in hot climates protecting the head from the heat of the sun, being a good non-conductor. It also diminishes the friction of clothing. The mustache protects the lungs from dust.

Connected with each hair follicle is a little band of involuntary muscular fibres, one end of which is attached to the follicle, the other to the skin near by. Under the influence of cold these muscles contract, puckering the skin and producing the peculiar appearance known as goose-flesh.

Sudden Blanching of the Hair.—Cases have occurred in which, under the influence of fear, grief, or some other strong emotion, the hair has turned white in a single night, a week, or some other short period. Examination of hair thus affected has shown that the cause of the change of color is the appearance in the hair of great numbers of minute air-bubbles.

The Sebaceous Glands.—Connected with the hair follicles are little glands for the secretion of a fatty substance. These glands discharge their contents into the hair follicles, whence they reach the skin.

The Nails.—These are horny plates which grow from a fold of skin near the ends of the fingers and toes. They are formed in a manner similar to that in which the hairs are produced. Their object is to protect the ends of the fingers and toes.

Functions of the Skin.—The skin performs a number of very important offices for the body. Perhaps the most important is that of excretion. Each of its millions of sweat glands is actively and constantly engaged in separating from the blood impurities which would destroy life if retained. These foul products are poured out through a corresponding number of minute sewers, and deposited upon the surface of the body to the amount of several ounces each day, or several pounds, if the whole perspiration be included in the estimate, as is commonly done.

The skin is also an organ of respiration; it absorbs oxygen, and exhales carbonic acid gas, with other poisonous gases. The amount of respiratory labor performed by the skin is about one one hundred and twentieth of that done by the lungs. In some lower animals, the whole work of respiration is performed by the skin. In the frog, the respiratory action of the skin and of the lungs is about equal.

Another important office of the cutaneous tissue is absorption.

The absorption of oxygen has already been referred to; but it absorbs liquids as well as gases, and to a much greater extent. By immersion in a warm bath for some time, the weight of the body may be very considerably increased. Dr. Watson, an English physician of note, reports the case of a boy whose weight increased nine pounds in twenty-four hours, solely by cutaneous absorption of moisture from the air. This extraordinary action was occasioned by disease. Seamen, when deprived of fresh water, quench their thirst by wetting their clothing with sea-water, the aqueous portion of which is absorbed by the skin. The lymphatic vessels are believed to be the principal agents in absorption.

Another remarkable function of the skin is the regulation of temperature. By its density and non-conducting property it prevents the escape of necessary heat to a considerable degree. But when the amount of heat generated in the body becomes excessive, either from abnormal vital activities or by exposure to external heat, the skin relieves the suffering tissues by favoring the escape of heat. This desirable end is attained through the evaporation of the moisture poured out upon the surface by the perspiratory glands.

It has been estimated that the evaporation of water from the cutaneous surface and from the mucous membrane of the lungs occasions the loss each minute of sufficient heat to raise a pint of water 100° F. in temperature. This is certainly a powerful, cooling process.

Lastly, we mention as a further function of the skin, and one which is not the least in importance, its utility as a sensitive surface. It is a well-established physiological fact that the mind is only a reflection of impressions received from without, or at least that its character is largely determined by the nature of the impressions made upon its organs of sensibility. The skin is the organ of touch, and of the various modifications of tactile sensibility. It is the most extensive organ of sensibility in the body, and is very closely connected with all the great nerve centers, so that it is perhaps the most efficient means through which to affect the general nervous system. Its intimate sympathy with internal organs is shown in the great number of diseases in which this organ evidently suffers on account of disability of some internal part.

The importance of the functions of the skin is shown by the fact that a person quickly dies when its action is interrupted. A coat of varnish or caoutchouc, applied over the whole skin, will kill a man al-

most as quick as a fatal dose of strychnia. In illustrative experiments, horses, dogs, and other animals have been killed by obstructing the action of the skin by some similar means. A little boy was once killed by covering him with gold-leaf to make him represent an angel at a great celebration.

The offensive odor of the perspiration, and the characteristic smell of the sweat-soiled under-clothing of a tobacco-user, are facts which well attest the value of the cutaneous functions in removing impurities from the body.

Cleanliness.—The skin is one of the most important depurating organs of the whole body. From each of its millions of pores constantly flows a stream laden with the poisonous products of disintegration. As the water evaporates, it leaves behind these non-volatile poisons, which are deposited as a thin film over the whole surface of the skin. As each day passes, the process continues, and the film thickens. If the skin is moderately active, three or four days suffice to form a layer which may be compared to a thin coating of varnish or sizing. The accumulation continues to increase, unless removed, and soon undergoes further processes of decomposition. It putrefies, rots, in fact, and develops an odor characteristic and quite too familiar, though anything but pleasant, being at once foul, fetid, putrid, pungent, uncleanly, and unpardonable.

But the offense to the nose is not the extent of the evil. The unclean accumulation chokes the mouths of the million little sewers which should be engaged in eliminating these poisons, and thus obstructs their work. Being retained in contact with the skin, some portions are reabsorbed, together with the results of advancing decay, thus repoisoning the system, and necessitating their elimination a second time.

Here water serves a most useful end if properly applied. It is unexcelled as a detergent, and by frequent application to the skin will keep it wholly free from the foul matters described. The necessity for frequent ablutions is well shown by the fact that nearly two pounds of a poison-laden solution, the perspiration, is daily spread upon the surface of the body. It is not an uncommon occurrence to meet with people who have never taken a general bath in their lives. Imagine, if possible, the condition of a man's skin, at the age of seventy or eighty years, which has never once felt the cleansing effects of a thorough bath!

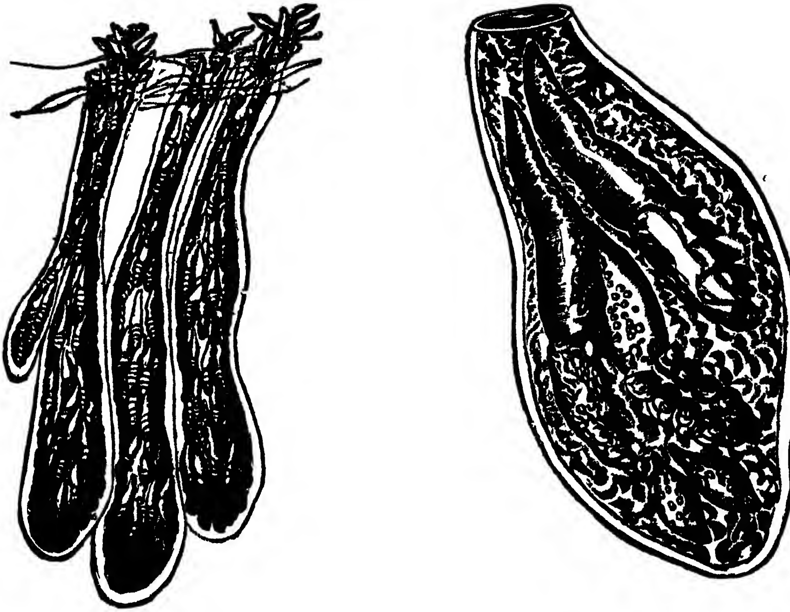
One of the most serious effects of this accumulation of filth is the clogging of the perspiratory ducts. Their valve-like orifices become obstructed very easily, and depuration is then impossible. It is not wonderful that so many people have torpid skins. The remedy is obvious, and always available.

How to Make the Skin Healthy.—A man who has a perfectly healthy skin is nearly certain to be healthy in other respects. In no way can the health of the skin be preserved but by frequent bathing. A daily or tri-weekly bath, accompanied by friction, will keep the skin clean, supple, and vigorous. There is no reason why the whole surface of the body should not be washed, as well as the face and hands. The addition of a little soap is necessary to remove the oily secretion deposited upon the skin.

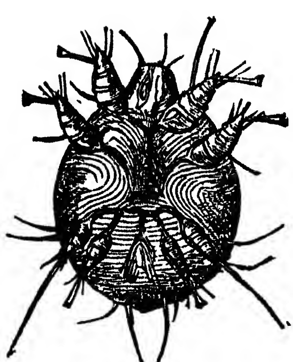
A lady of fashion, in enumerating the means for preserving beauty, says: "Cleanliness, my last recipe (and which is applicable to all ages), is of most powerful efficacy. It maintains the limbs in their pliancy, the skin in its softness, the complexion in its lustre, the eyes in their brightness, the teeth in their purity, and the constitution in its fairest vigor. To promote cleanliness, I can recommend nothing preferable to bathing. The frequent use of tepid baths is not more grateful to the sense than it is salutary to the health and to beauty. . . . . . By such means, the women of the East render their skins softer than that of the tenderest babe in this climate." "I strongly recommend to every lady to make a bath as indispensable an article in her house as a looking-glass."

When the foul matters which ought to be eliminated by the skin and quickly removed from the body are allowed to remain undisturbed, the skin becomes clogged and inactive, soon loses its natural lustre and color, becoming dead, dark, and unattractive. When bathing is so much neglected, it is no marvel that paints, powders, lotions, and cosmetics of all sorts, are in such great demand. A daily bath, at the proper temperature, is the most agreeable and efficient of all cosmetics.

Bathing Protects against Colds.—It is an erroneous notion that bathing renders a person more liable to "take cold, by opening the pores." Colds are produced by disturbance of the circulation, not by opening or closure of the pores of the skin. Frequent bathing increases the activity of the circulation in the skin, so that a person is far less subject to chilliness and to taking cold. An individual who takes a daily cool bath has perfect immunity from colds, and is lit-



Demodex Folliculorum in Fat Glands



Acarus Scabiei (Itch Mite).

Demodex Folliculorum.

PLATE VIII.—*ARISTOCRATIC VERMIN.*

tle susceptible to changes of temperature. Colds are sometimes taken after bathing, but this results from some neglect of the proper precautions necessary to prevent such an occurrence, which are carefully stated elsewhere in this work.

Aristocratic Vermin.—Doubtless not a few of those very refined and fastidious people who spend many hours in the application of all sorts of lotions and other compounds to the face and hands, for the purpose of beautifying those portions of the skin exposed to view—while neglecting as persistently those parts of the skin protected from observation—would be very much surprised to learn the true condition of the unwashed portions of their cutaneous covering. They instinctively shrink with disgust from the sight of a vermin-covered beggar, in whose cuticle burrows the *acarus scabiei* (itch-mite), while troops of larger insects are racing through his tangled locks and nibbling at his scaly scalp. It is quite possible that many a fair "unwashed" would faint with fright if apprized of the fact that her own precious covering is the home of whole herds of horrid-looking parasites which so nearly resemble the itch-mite as to be at least a very near relative, perhaps half-brother or cousin. The name of this inhabitant of skins unwashed is as formidable as the aspect of the creature, though it does not require a microscope to display its proportions, as does the latter; scientists call it, *demodex folliculorum*. See PLATE VIII.

The *demodex* makes himself at home in the sebaceous follicles, where he dwells with his family. Here the female lays her eggs and rears her numerous family, undisturbed by the frictions of any flesh-brush, and only suffering a transient deluge at very long intervals, if such a casualty happens. In studying the structure of these little parasites, we have found several tenants occupying a single follicle, pursuing their domestic operations quite unmolested by any external disturbance.

The *demodex* has been transplanted from the human subject to the dog; and it is found that the new colony thrives very remarkably, and soon produces a disease apparently identical with that known as "mange."

We have not space to describe in detail these savage little brutes, with their eight legs, armed with sharp claws, bristling heads, sharp lancets for puncturing and burrowing into the skin, and their powerful suckers for drawing the blood of their victims. We care only to impress upon the mind of the reader the fact that neglect of bathing and friction of the skin is sure to encourage the presence of millions of these parasites, and that the only remedy is scrupulous cleanliness of the whole

person. Like their relatives, the itch-mite, they do not thrive under hydropathic treatment, and are very averse to soap and water. The best way to get rid of them is to drown them out. They do not produce the irritation which characterizes the presence of the itch insect, so that this evidence of their presence is wanting. But they are sure to be present in a torpid, unhealthy, unwashed skin, no matter how delicate or fastidious its possessor.

Bathing a Natural Instinct.—All nature attests the importance of the bath. The rain is a natural shower bath in which all vegetation participates, and gains refreshment. Its invigorating influence is seen in the brighter appearance, more erect bearing, and fresher colors of all plants after a gentle rain. The flowers manifest their gratitude by exhaling in greater abundance their fragrant odors. Dumb animals do not neglect their morning bath. Who has not seen the robin skimming along the surface of the lake or stream, dipping its wings in the cool waters, and laving its plumage with the crystal drops that its flapping pinions send glittering into the air? No school-boy who has ever seen the elephant drink will forget how the huge beast improved the opportunity to treat himself to a shower bath, and perhaps the spectators as well, for he is very generous in his use of water.

If man's instincts were not rendered obtuse by the perverted habits of civilization, he would value the bath as highly and employ it as freely as his more humble fellow-creatures, whose instinctive impulses have remained more true to nature, because they have not possessed that degree of intelligence which would make it possible for them to become so grossly perverted as have the members of the human race. Man goes astray from nature not because he is deficient in instinct, but because he stifles the promptings of his better nature for the purpose of gratifying his propensities.

Clothing.—The natural requirements for dress are the following:—

1. Modesty requires that the body should be clothed.

2. Protection against sudden changes of temperature is required for the maintenance of health.

The dusky savage who roams the tropical wilds of Central Africa finds no necessity for clothing. Modesty is to him unknown. The genial climate of his native forests insures him against vicissitudes of temperature, and so he lives as he was born, protected only by the swarthy cloak which nature gave him. Civilization creates the first requirement for clothing, and the varying temperatures of the temperate and frigid zones create the second.

Essential Qualifications of Clothing.—In order to properly meet the wants of the body in fulfilling the above requirements, clothing must possess the following qualifications:—

1. It must allow unrestrained action of every organ of the body.
2. It must secure equable temperature of all portions of the body.
3. Its weight must be as light as possible without sacrificing other necessary qualities.
4. It must be so adjusted to the body as to be carried with the slightest possible effort.

It will be admitted at once that clothing such as will meet the above requirements is not what is recommended by the fashion leaders of the day; but if ladies would forget fashion, and make their garments in accordance with the principles of sound common sense, they would soon be delighted to find themselves emancipated from the numerous ills which afflict them in consequence of their present mode of dress, as has been already pointed out. It may be that circumstances will not always allow of the adoption of a dress which shall be wholly physiological in every respect, which is to be regretted. Custom has so long ruled that we are forced to yield a little to its mandates, though reluctantly. But it is quite possible for every woman to adopt a dress which shall be, in all essential particulars, free from serious defects, and that without sacrificing an iota of her native grace or modesty, or making a martyr of herself or her friends.

In the first place, the corset and all its substitutes and subterfuges, tight belts, and every other device for compressing the waist or any other part of the body, can be at once discarded without drawing the attention of any one to the fact, unless it be by the more elastic and graceful step, the brighter color of the face, and the general improvement in health in all respects. Suppose the waist does expand a little—or a good deal, even—beyond the standard seventeen inches; is it any disgrace? No, indeed. A woman ought to be proud of a large waist. A large waist indicates large lungs and large vital organs, which, in turn, represent the probabilities of long life. A small waist indicates precisely the opposite. Why should woman—the gentler sex—be compelled to wear a strait-jacket, like a madman or a criminal, while man is allowed to go untrammeled by any such impediment? A strong popular sentiment in favor of large waists would soon do away with the foolish emulation to look frail and slender. If required, a suitable garment may be made to support the bust, which will fit the form neatly without com-

pressing any part. Able physicians declare that compression of this part of the body, and the wearing of an undue amount of clothing, thus producing a local increase of temperature, is the cause of many of the peculiar diseases of woman, acting through reflex influence upon internal organs.

The next important step should be to regulate the clothing properly. The whole body should be clad in soft flannel from neck to wrists and ankles nearly the year round. It is better to have the underclothing for the upper part of the body and that for the limbs combined in one garment. If arranged in two garments, they should only meet, and not overlap, as this gives too much additional heat over the abdominal organs. A woman's limbs require as many thicknesses as a man's; and a garment which fits the limb closely will afford four times the protection given by a loose skirt. Thick shoes or boots with high tops, and heavy woolen stockings which are drawn up outside the undergarments clothing the limbs, complete the provision for warmth. Leggins should be worn in cold weather.

All the undergarments should be suspended from the shoulders by means of waists or suspenders. Waists are doubtless the better for the purpose. If several garments are to be suspended from the same waist, the rows of buttons to which they are attached should be arranged one above another, to avoid bringing several bindings together.

The two *most important* particulars having been secured—freedom from compression and uniform temperature—the outside dress may receive attention. It should be as simple as possible, and consistent with the mental comfort of the wearer. Gaudy colors and conspicuous ornaments betray poor taste and a vain, shallow mind. Many flounces, folds, and heavy skirts are objectionable on account of their weight, to say nothing of the useless expenditure of time and money which they occasion.

The proper length of the skirt is a question of interest in this connection. How long shall it be? If physiology alone were asked the question, the answer would be that women do not need long skirts more than men, and that they are really an impediment to locomotion, and often very inconvenient. Long-established custom says that women *must* wear skirts. Fashion says she must wear *long* skirts. Custom and fashion have prevailed so long that they have created an artificial modesty which seems to demand that woman's dress shall differ from man's by the addition of a skirt, at least, even if they are

alike in all other particulars. This being the case, the best we can do is to modify the skirt so that it will be as free from objections as possible. The great evils of long skirts are, unnecessary weight, the accumulation of moisture which is transferred to the feet and ankles, and sundry inconveniences to the wearer in passing over rough places, up and down stairs, etc.

The obvious remedy for these defects is to curtail the length of the dress. The train must be discarded at once as too absurd and uncleanly, with its filthy load of gleanings from the gutter, to be tolerated. Any further improvement, to be of practical utility, must shorten the skirt to the top of the ankle; and a radical dress-reformer will want to make it a few inches shorter.

A very serious mistake is made by those who adopt the reform in the length of the dress, even to the fullest extent, but make no reform in other respects. Such overlook the chief defects which need reformation, paying their whole attention to a point which, considered from a physiological standpoint, is of minor importance, although well deserving of all the attention it receives.

False Hair and Hair Dyes.—The ungainly masses of unnecessary material which fashion has heaped upon the heads of those who bow to her authority, are a frightful cause of diseases of the scalp and brain. The immense loads of hair, jute, or other material, which are attached to the head, cause a great increase of the temperature of the brain and scalp. The blood-vessels become congested, both externally and internally. The result of this constant surplus of blood is disease of the scalp and of the brain itself. Headache is an almost constant symptom of the injury which is being wrought by this improper treatment of the head.

In consequence of the disease of the scalp, the hair soon becomes diseased, loses its brilliancy and color, becomes dry and harsh, and in many cases is lost altogether, complete and incurable baldness ensuing.

The congestion of the brain which at first occasions only headache, when continued produces structural disease of that organ. The blood-vessels become weakened, and sometimes ruptured, when the patient either dies of apoplexy or lingers a miserable paralytic.

When the head is encumbered with an unnatural mass of hair, and the brain is clogged by the excessive amount of blood and supernatural heat which result, the mind cannot act freely and naturally; hard study, deep thought, and continued mental exercise are impossible. This is the

reason why fashionable young ladies find study so hard for them, and apparently injurious. The incubus of such a prodigious weight as many a fashionable lady carries upon her cranium would be quite sufficient to eclipse the mental powers of the most brilliant genius. No wonder that woman has sometimes failed in mental competition with her brothers in the schools. The wonder is that she lives and possesses even a modicum of mental vigor. Under equally favorable circumstances, woman should be man's peer in mental power and development; but if she wishes to secure and maintain the equality of the sexes, which so many earnest women are just now demanding, she must throw away her chignons and waterfalls, shake off her "rats and mice," and don a simpler, healthier head-gear.

The real hair that is sold to those whose tresses are considered too scanty is chiefly obtained from the bodies of dead persons, whose graves are plundered for the purpose by wretches who earn their living by this means. Vermin of various kinds often adhere to the hair, and infest the heads of those who wear it. Various imitations of hair also become the means of conveying loathsome parasites to the scalps of those who wear them.

The use of hair dyes is a practice which the chemist and experience have both shown to be eminently dangerous. All hair dyes are poisonous. No matter how strong the assertions of their harmlessness, they are utterly false. So-called vegetable hair dyes, hair invigorators, tonics, etc., are contemptible swindles. They contain mineral poisons. The greater portion of them contain lead. The effect of their use is not only to destroy the hair and induce disease of the scalp, but to produce paralysis. Many cases of chronic headache have been occasioned by the use of these poisonous mixtures; and in a number of cases, insanity has been the result.

The use of these vile compounds, which are so widely sold and used, is usually as absurdly foolish as harmful.

The Kidneys.—Figs. 131 and 132. These organs are located in the back part of the abdominal cavity, between the lower ribs and the upper border of the hip bone. In shape they resemble a kidney-bean, and each weighs four to six ounces. The greater portion of the kidney is made up of minute tubes, which terminate in the outer part of the organ in extremely minute round sacs, each of which contains a delicate, coiled capillary blood-vessel. It is by these bodies that the elements of the urine are separated from the blood. All the tubes

lead toward the center of the organ, where they empty into a cavity called the *pelvis* of the kidney, which narrows down into a small canal, the *ureter*, by which the urine is conveyed to the *bladder*, a pouch-like reservoir located in the lower part of the abdomen, from which the urine is discharged through another small canal, the *urethra*.

Fig. 131. The Kidney, showing the arteries and veins of the organ; 13. the Supra-renal Capsule; and 3. the Ureter.

The urine is chiefly composed of water, which carries in solution a large number of excrementitious principles, the chief of which is urea, one of the most abundant and most poisonous of. all the waste elements of the body. When the liver is inactive, the urine usually contains some biliary elements. Sugar is also found in the urine soon after a meal in which an excess has been taken. The condition of the urine is an important means of ascertaining the state of the system, and hence we shall speak elsewhere of the various points to be learned by its chemical and microscopical examination.

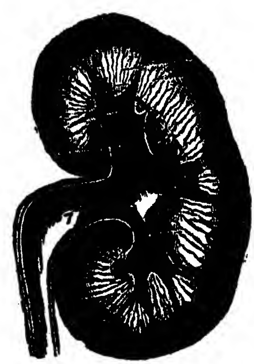


Fig. 132. Showing the internal structure of the Kidneys.

The Liver.—This is the largest gland in the body, weighing between four and five pounds. It is a little larger, proportionately, in women than in men. The liver is made up of minute, roundish lobules, about $\frac{1}{25}$ of an inch in diameter, each of which is furnished with branches from the hepatic artery and also from the portal vein. The liver thus contains a double capillary net-work. In addition, there is a system of minute ducts or canals running through its whole substance, by means of which the bile which is separated from the portal vein is drained off into a pouch upon its under surface, the gall bladder, or into the small intestine.

The Bile.—This is a greenish, bitter, alkaline fluid, somewhat viscid in character. The amount produced each day is about two and one-half pounds. It is produced much more rapidly during digestion than at other times.

As already observed, the bile is both a secretion and an excretion. As a secretion, it aids digestion. As an excretion, it removes from the body a poisonous substance called *cholesterine*, a waste product of the nervous system. This, when concentrated, is found to be a resinous substance. It forms the chief part of many gall-stones.

Fig. 133. Spleen.

The functions of the liver are somewhat complicated. In addition to its secreting and excretory functions, it is thought to be a sugar-forming organ, and to be capable of completing the digestion of some elements of the food. It is now believed, also, that it destroys and removes from the system worn-out red blood corpuscles.

The Spleen.—Among other glands should also be mentioned the spleen (Fig. 133), a gland found in the left side of the abdominal cavity next to the left end of the stomach, to which it is attached. Its weight is about seven ounces. It belongs to a class of structures known as blood glands or ductless glands, because it has no duct. However, it receives a very large supply of blood, and is supposed to have something to do with the production or destruction of blood corpuscles. It may be removed from the body, in animals, without producing death. The effect of its removal in cats is to cause them to become very fat. It is also observed that they become very irritable after its removal. It is said that the farmers in some parts of England make a practice of removing the spleen in young calves in order to cause them to fatten faster.

Other Blood Glands.—Under this head are also included the supra-renal capsules, which are attached to the upper part of the liver; the thyroid gland, situated at the upper part and on either side of the trachea; the thymus gland, found only in early life, at the lower part of the trachea; the pituitary body and the pineal gland, found in the central part of the brain. Of these glands little else is known than their location and structure.

Animal Heat.—Warm-blooded animals possess the power to regulate their own temperature independent of external temperatures, at least within certain limits. What are called cold-blooded animals do not possess this power, their temperature depending on that of the medium with which they are surrounded. The source of animal heat is the various vital changes constantly taking place in the body.

This is shown by the fact that the amount of heat produced is exactly proportionate to the intensity of the vital changes. In health the temperature of the body is about 98½° F. When the system is under the influence of fever or an extensive inflammation of any sort,—which process greatly accelerates vital changes,—the temperature rises several degrees above the normal standard, sometimes as high as 110° F., though a temperature above 107° is considered to be almost certainly fatal if long continued. This same principle is observed in lower animals and even in flowering plants. The latter absorb oxygen most rapidly when flowering; and in many instances it has been shown by careful experiment that the process of flowering in plants is accompanied with a marked production of heat. Birds absorb large quantities of oxygen, and have very active vital processes. In them the temperature of the body is several degrees higher than in man and quadrupeds. In fish and reptiles, on the other hand, in which the vital processes are much slower, the temperature is much lower, being, in fact, usually about that of the surrounding air or water in which they live, their heat production being actually too small to enable them to maintain an independent temperature. A French physiologist experimented upon a marmot a few years ago, and found that when the animal was asleep, its temperature was only about 40° F., while it was 89° F. when awake. In all hibernating animals there is a marked decrease in the temperature while the animal is in a state of hibernation.

There is good reason for believing that the friction of the blood in the blood-vessels is an important source of heat. Carefully conducted experiments show that the force exerted by the heart each twenty-four hours, which is all used up or transformed in the body, is equivalent to more than 1,000 degrees of heat, or sufficient to raise 100 lbs. of water 10° F. in temperature. The fact that heat is produced by conversion of the force expended in the circulation, is further shown by a series of experiments made by the eminent French physiologist, Bernard, for the purpose of ascertaining the temperature of the blood in various parts of the body. He found that the blood of the portal vein and that of the hepatic vein is warmer than that of any other part of the body, that in the hepatic vein showing the highest temperature of all, which may be in part attributable to the fact that the blood of this vein has passed through two sets of capillaries, so that its force has been almost wholly converted into heat.

REPRODUCTION.

Believing that ignorance on this subject lies at the root of some of the most serious diseases and the most degrading vices to which human beings are subject, we have not hesitated to introduce it here, in order to do our part in enlightening the world with reference to the dangers from a source, which, too often unsuspected, pours forth contamination and degradation, blighting the prospects of the most promising, and sparing none who place themselves knowingly or unwittingly within its reach. The greater portion of this chapter is in substance quoted from our work upon the subject entitled, "Plain Facts for Old and Young."

Reproduction is a function common to all animals and to all plants. Every organized being has the power to reproduce itself, or to produce, or aid in producing, other individuals like itself. It is by means of this function that plants and animals increase or multiply.

When we consider the great diversity of characters illustrated in animal and vegetable life, and the infinite variety of conditions and circumstances under which organized creatures exist, it is not surprising that modes of reproduction should also present great diversity both in general character and in detail.

Simplest Form of Generation.—Deep down beneath the waters of the ocean, covering its bottom in certain localities, is found a curious slime, which, under the microscope, is seen to be composed of minute rounded masses of gelatinous matter, or protoplasm. By watching these little bodies intently for a few minutes, the observer will discover that each is a living creature capable of moving, growing, and assuming a variety of shapes. Continued observation will reveal the fact that these little creatures multiply; and a more careful scrutiny will enable him to see *how* they increase. Each divides into two equal parts so nearly alike that they cannot be distinguished from each other. In this case the process of generation is simply the production of two similar individuals from one.

A small quantity of slime taken from the surface of a stone near the bottom of an old well or at the seaside, when placed under the microscope, will sometimes be found to contain large numbers of small, round, living bodies. Careful watching will show that they also mul-

tiply by division; but before the division occurs, two cells unite to form one by a process called *conjugation.* Then, by the division of this cell, instead of only two cells, a large number of small cells are formed, each of which may be considered as a bud formed upon the body of the parent cell and then separated from it to become by growth an individual like its parent, and, like it, to produce its kind. In this case, we have new individuals formed by the union of two individuals which are to all appearance entirely similar in every particular.

Sex.—Rising higher in the scale of being, we find that, with rare exceptions, reproduction is the result of the union of two dissimilar elements. These elements do not, in higher organisms, as in lower forms of life, constitute the individuals, but are produced by them; and being unlike, they are produced by special organs, each adapted to the formation of one kind of elements. The two classes of organs usually exist in separate individuals, thus giving rise to distinctions of *sex;* an individual possessing organs which form one kind of elements being called a male, and one possessing organs for the formation of the other kind of elements, a female. The sexual differences between individuals of the same species are not, however, confined to the sexual organs. In most classes of plants and animals, other sexual differences are very great. In some of the lower orders of animals, and in many species of plants, the male and female individuals are so much unlike that for a long time after they were well known, no sexual relation was discovered.

Hermaphrodism.—An individual possessing both male and female organs of reproduction is called an *hermaphrodite.* Such a combination is very rare among higher animals; but it is by no means uncommon among plants and the lower forms of animal life. The snail, the oyster, the earth-worm, and the common tape-worm, are examples of true hermaphrodites. So-called human hermaphrodites are usually individuals in whom the sexual organs are abnormally developed so that they resemble those of the opposite sex, though they really have but one sex, which can usually be determined with certainty. Only a very few cases have been observed in which both male and female organs were present.

There is now living in Germany an individual who bears the name of a woman; but learned physicians have decided that the person is as much man as woman, having the organs of both sexes. What is

still more curious, this person has the feelings of both sexes, having loved at first a man, and afterward a woman. There have been observed, also, a very few instances of individuals in whom the sexual organs of neither sex were present. It thus appears that a person may be of both sexes or of no sex at all.

Sex in Plants.—To one unacquainted with the mysteries of plant life and growth, the idea of attaching sexuality to plants seems very extraordinary; but the botanist recognizes the fact that the distinctions of sex are as clearly maintained in the vegetable as in the animal kingdom. The sexual organs of the higher orders of plants are flowers. That part of the flower which produces seeds answers to the female; another part, which is incapable of forming seeds, answers to the male. The fertile and sterile flowers are sometimes produced on separate plants. Very frequently, they are produced upon separate parts of the same plant, as in the oak, walnut, and many other forest trees, and Indian corn. In the latter plant, so familiar to every one, the "tassel" contains the male flowers, and the part known as the "silk," with the portion to which it is attached—which becomes the ear—the female or fertile flowers. In a large number of species, the male and female organs are combined in a single flower, making a true hermaphrodite.

Sex in Animals.—As previously remarked, individuals of opposite sex usually differ much more than in the character of their sexual organs only. Among higher animals, the male is usually larger, stronger, and of coarser structure than the female. The same contrast is observed in their mental characters. With lower animals, especially insects, the opposite is often observed. The female spider is many times larger than the male. The male ant is small in size when compared with the female. Nevertheless, in all classes of animals the difference in the structure and the functions of the sexual organs is the chief distinguishing character. These differences are not so great, however, as they might at first appear. The male and female organs of reproduction in man and other animals, which seem so dissimilar, when studied in the light shed upon this subject by the science of embryology, are found to be wonderfully alike in structure, differing far more in appearance than in reality, and being little more than modifications of one general plan. Every organ to be found in the one sex has an analogue in the other which is complete in every particular, corresponding in function, in structure, and usually in position.

Other Sexual Differences.—In this country there is between five and six inches difference in height and about twenty pounds difference in weight between the average man and the average woman, the average man being about five feet, eight inches in height, and weighing one hundred and forty-five pounds; while the average woman is five feet, two or two and one-half inches in height, and weighs one hundred and twenty-five pounds. The relation of the sexes in height and weight varies in degree in different countries, but is never changed. The average height and weight of American men and women is above that of the average human being.

Men and Women Differ in Form.—The differences in form are so marked that it is possible for the skilled anatomist to determine the sex of a human being who has been dead for ages, by an examination of the skeleton alone. In man, the shoulders are broad, the hips narrow, and the limbs nearly straight with the body. In woman, the shoulders are narrow and usually rounded, and set farther back, the collar-bone being longer and less curved, giving the chest greater prominence; while the hips are broad.

The consequence of these differences is that woman is generally less graceful and naturally less skillful in the use of the extremities than man, and hence less fitted for athletic sports and feats requiring great dexterity. A girl throws a stone awkwardly, less from want of practice than from a natural peculiarity of physical structure. A woman walks less gracefully than a man, owing to the greater relative breadth of her hips, requiring a motion of the body together with that of the limbs. In consequence of this peculiarity, a woman is less fitted for walking long distances.

The Male and the Female Brain.—But there are other important physical differences to which we must call attention. Man possesses a larger brain than woman, but she makes up the deficiency in size by superior fineness in quality. The female brain differs from the masculine organ of mentality in other particulars so marked that one who has given the subject attention can determine with perfect ease the probable sex of the owner of almost any skull which might be presented to him. This difference in the conformation of the skull is undoubtedly due to a difference in mental character, which, in turn, depends upon a difference in cerebral development.

Vital Organs of Man and Woman.—The anatomist also observes an interesting difference in the size of the various vital organs. For

example, while a woman has a heart proportionally smaller than the same organ in man, she has a larger liver. Thus, while less well fitted for severe physical exertion by less circulatory power, she has superior excretory powers.

This peculiarity of structure is perfectly harmonious with the fact which experience has established so often as to make the matter no longer a question, that woman is less fitted for severe muscular exertion than man, but possesses in a superior degree the quality known as endurance. With a less robust frame, a more delicately organized constitution, she will endure for months what would kill a robust man in as many weeks. More perfect elimination of the wastes of the body secures a higher grade of vitality. On no other hypothesis could we account for the marvelous endurance of the feminine part of the civilized portion of the human race, ground down under the heel of fashion for ages, "stayed," "corseted," "laced," and thereby distorted and deformed in a manner that would be fatal to almost any member of the masculine sex.

The Reproductive Elements.—As has been previously observed, in all except the very lowest forms of life, two elements are necessary to the production of a new individual, or a reproduction of the species,—a male element and a female element. The special organs by means of which these elements are produced, brought together, and developed into the new individual in a more or less perfect state, are termed *sexual organs*, as we have already seen. As an introduction to the specific study of the sexual organs in the human species, let us briefly consider the—

Sexual Organs of Plants.—As already remarked, flowers are the sexual organs of plants. Nothing is more interesting in the natural world than the wonderful beauty, diversity, and perfect adaptability to various conditions and functions, which we see in the sexual parts of plants. An exceedingly interesting line of study, which has occupied the attention of many naturalists, is the wonderful perfection displayed in the adaptability of the male and female parts of plants to each other. Without burdening the reader with unnecessary technicalities of detail, we will briefly notice the principal parts of vegetable sexual organs as illustrated in flowers.

Complete flowers are made up of four parts, two of which, the *stamen* and *pistil*, are essential, while the other two, the calyx and corolla, are accessory.

The *calyx* is that part which surrounds the flower at its outer and

lower part. It varies greatly in form and color, but is most frequently of a green or greenish color.

Just within the calyx is the *corolla,* which usually forms the most attractive, showy, and beautiful part of the flower. The beautifully colored petals of the rose, geranium, dahlia, and similar flowers, form their corollas. In Fig. 134 is given a diagramatic view of the various parts of a perfect flower.

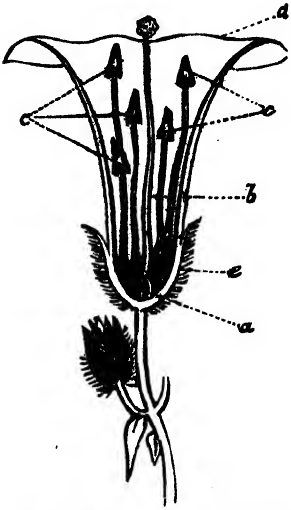


Fig. 134. *a.* Ovary; *b.* Pistil; *c c.* Stamens and Anthers; *d.* Corolla; *e.* Calyx.

Sexual Organs of Animals.—The male reproductive element is called a *spermatozoön* or *zoösperm.* The female element is called an *ovum,* literally, an egg.

A spermatozoön somewhat resembles a tadpole in appearance, having, however, a much longer tail in proportion to the size of the body, as will be seen by reference to Fig. 135.

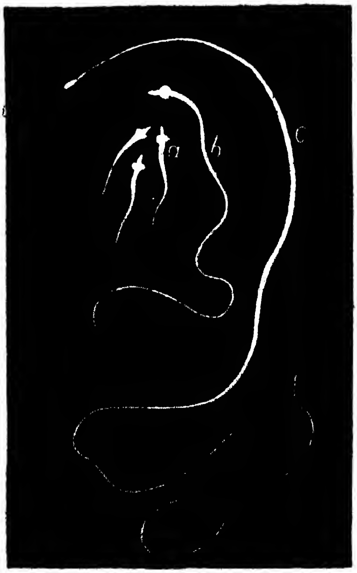


Fig. 135. *a.* Human Spermatozoa; *b.* Spermatozoa of the rat; *c.* Spermatozoa of Menobranchus. (Dalton.)

Human spermatozoa are about $\frac{1}{600}$ of an inch in length. Those of reptiles are very much larger. One of the remarkable features of these minute elements is their peculiar movements. While alive, the filamentous tail is in constant action in a manner strongly resembling the movements of the caudal appendage of a tadpole. This wonderful property led the earlier observers to believe that they were true animalcula. But they are not to be regarded as such, though one can scarcely make himself believe otherwise while watching their lively evolutions, and apparent volitionary movements from one point to another.

In man the formation of spermatozoa continues with greater or less rapidity from puberty to old age, though at the two extremes of existence they are imperfectly developed. When not discharged from the body, they are said to be absorbed. Some physiologists claim that they are composed of a substance identical with nerve tissue, and that by absorption they play a very important part in the development and maintenance of the nervous system.

It is asserted by good authorities that the reproductive element in man is not so well developed as to be really fit for the reproduction of the species before the age of twenty-four or twenty-five. After the age of forty-five or fifty, the reproductive elements deteriorate in quality, and become again unfitted for vigorous procreation.

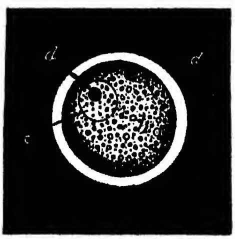


Fig. 136. Human Ovum, magnified one hundred and thirty diameters. (Dalton.)

The Ovum.—Fig. 136. The female element of generation, the ovum, is produced by an organ called the *ovary*, of which there are two in each individual. The human ovum varies in size from $\frac{1}{240}$ to $\frac{1}{120}$ of an inch in diameter, and consists of a single cell. Ova are not formed in such large numbers as zoösperms. As a general rule, in the human female, a single ovum is developed and discharged once in about four weeks, during the period of sexual activity.

Fecundation.—It is often asked, and the question has elicited some discussion, Which is the principal reproductive element; the zoösperm, or the ovum? The ancients supposed the male element to be the essential element, being simply nourished and developed by the female; but modern research in biological science does not sustain this view. Probably neither one enjoys especial preëminence; for neither can undergo complete development without the other. In very rare cases, the ovum has been observed to undergo a certain amount of development of itself; but a perfect individual can be produced only by the union of the two kinds of elements, which process is known as *fecundation*. The instant this union occurs, the life of a new individual begins. All the changes which result between that moment and the birth of the individual are those of development only. Indeed, the same existence continues from the instant of the union of the two elements, not only until birth, but through growth, the attainment of maturity, the decline of life, and even until death.

It is interesting to observe the different methods by which fecundation is effected, both in plants and animals, for this is a process common to both.

Fecundation in Flowers.—The great naturalist, Linnæus, was the first to explain the reproductive process in plants. He tells us that "the flower forms the theater of their amours; the calyx is to be considered as the nuptial bed; the corolla constitutes the curtains; the anthers are the testes; the pollen, the fecundating fluid; the stigma of the pistil, the external genital aperture; the style, the vagina, or the conductor of the prolific seed; the ovary of the plant, the womb; the reciprocal action of the stamens on the pistil, the accessory process of fecundation."

Modes of Fecundation in Animals.—The modes by which fecundation is effected in animals are still more various and wonderful than in plants. In some of the lower animals, as in most fish and reptiles, both elements are discharged from the bodies of the parents before coming in contact, there being no contact of the two individuals. In this class of animals the process is almost wholly analogous to fecundation in those plants in which the male and female flowers are on different plants or different parts of the same plant. In the female fish, a large number of ova are developed at a certain season of the year known as the spawning season. Sometimes the number reaches many thousands. At the same time, the testicles of the male fish, which are contained within the abdominal cavity, become distended with developed zoösperms. When the female seeks a place to deposit her eggs, the male closely follows; and as she drops them upon the gravelly bottom, he discharges upon them the zoösperms by which they are fecundated. The process is analogous to that observed in some species of frogs. When the female is about to deposit her eggs, the male mounts upon her back and rides about until the eggs are all deposited, discharging upon them the fertilizing spermatozoa as they are laid by the female.

Development.—After the union of the two elements, known as fecundation or *conception*, if the conditions are favorable, development occurs, and the little germ is in due process of time developed into an individual which is an exact counterpart of its parents. During this developmental process, the embryonic being is variously treated by different classes of animals.

Unprotected Development.—Most fishes and reptiles discharge their ova before fecundation, or soon after, and pay no further attention to them. The fish deposits its eggs in a little hollow scooped out in the gravelly bed of a stream, or sows them broadcast upon the waters. The turtle buries its eggs in the sand, and leaves them to be hatched by the sun. The ostrich disposes of her eggs in the same way. Many other species of animals pay no regard to the protection of the germs which are destined, if placed under favorable conditions, to become individuals like themselves.

Development in the Higher Animals and Man.—Higher animals are less prolific, and their development is a more complicated process; hence, their young need greater protection, and, for this reason, the ova, instead of being discharged from the body of the female after fecundation, are retained.* As we have seen that a suitable receptacle is sometimes provided outside of the body, so now a receptacle is needed, and is provided in the interior of the body of the female. This receptacle is called—

The Uterus.—This is a hollow, pear-shaped organ, located in the median line, just behind the bladder, between it and the rectum. It is supported in place by various ligaments and by the juxtaposition of other organs. Its larger end is directed upward, and communicates upon each side with a very narrow tube which is prolonged outward on either side until it nearly touches the ovary of the same side. When an ovum is matured, it escapes from the ovary into the narrow tube referred to, called the *Fallopian tube*, and passes down into the cavity of the uterus. If fecundation does not occur, it is expelled or absorbed after six to twelve or fourteen days.

Uterine Gestation.—This is the term applied to the process last referred to. We shall not attempt to describe in detail this most wonderful and intricate of all living processes; but will sketch only the chief points, leaving the reader who would obtain a more complete knowledge

* Curious examples of internal development sometimes occur in animals which usually deposit eggs. Snakes have been known to produce both eggs and living young at the same time. At the annual meeting of the American Society for the Advancement of Science, at Detroit, Mich., in August, 1875, we had the pleasure of examining a specimen, exhibited by Prof. Wilder, of a chick which had undergone a considerable degree of development within the ovary of the hen. It had a head, a rudimentary brain, and internal viscera, but no feathers nor limbs. It was, in fact, an egg hatched before it had been laid. This anomaly excited much interest at that time and since among biologists.

of the subject to consult any one of the numerous physiological and obstetrical works which deal with it in a very exhaustive manner.

As soon as the ovum is impregnated by the male element, it begins a process of symmetrical division. The first division produces two cells out of the single one which first existed. By the next division, four segments are produced; then eight, sixteen, etc. Fig. 137. While this process is going on, the ovum becomes adherent to the internal wall of the uterus, and is soon enveloped by its mucous membrane, which grows up about and incloses it.

The Primitive Trace.—When the process of segmentation has advanced to a certain point, the cells are aggregated together in a compact layer at the surface. Soon a straight line appears upon this layer, which is called the *primitive trace.* Fig. 138. This delicate line becomes the basis for the spinal column; and upon and about it the whole individual is developed by an intricate process of folding, dividing, and reduplication of the layer of cells. One end of the line becomes the head, and the other becomes the tail. Even man has a caudal appendage at an early stage of his existence. After a further lapse of time, little excrescences, buds, or "pads," appear in the proper positions to represent the arms and legs. After further development the ends split up into fin-

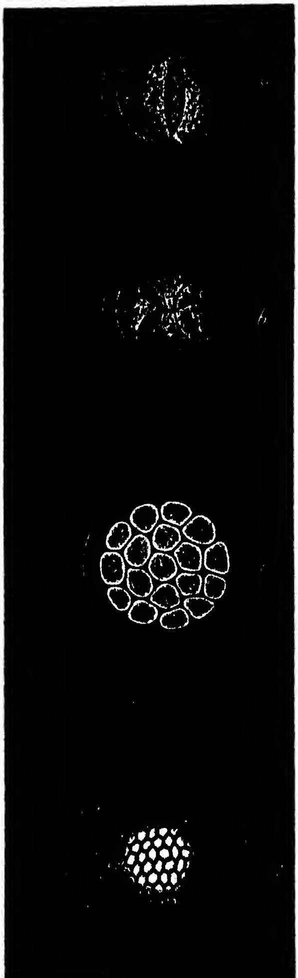


Fig. 137. Diagram illustrating the segmentation of the Ovum.

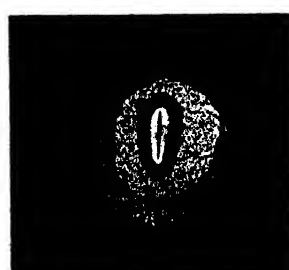


Fig. 138. The Human Ovum after fecundation, showing primitive trace.

gers and toes, and by the continued development of the parts, perfect arms and legs are formed.

Curious Relation to Lower Animals.—It is a very remarkable fact that in the lower animals we have numerous examples in which the permanent condition of the individual is the same as some one of the stages through which man passes in the process of development. An eminent author makes the following interesting statements:—

"The webbed feet of the seal and ornithorhynchus typify the period when the hands and feet of the human embryo are as yet only partly subdivided into fingers and toes. Indeed, it is not uncommon for the 'web' to persist to some extent between the toes of adults; and occasionally children are born with two or more fingers or toes united to their tips.

"With the seal and the walrus, the limbs are protruded but little beyond the wrist and ankle. With the ordinary quadrupeds, the knee and elbow are visible. The cats, the lemurs, and the monkeys form a series in which the limbs are successively freed from the trunk, and in the highest apes they are capable of nearly the same movements as the human arm and leg, which, in their development, passed through all these stages."

Simplicity of Early Structures.—The first structures formed are exceedingly simple in form. It is only by slow degrees that the great complexity which characterizes many organs is finally attained. For example, the heart is at first only a straight tube. By enlargement and the formation of longitudinal and transverse partitions, the fully developed organ is finally produced. The stomach and intestines are also at first but a simple straight tube. The stomach and large intestine are formed by dilatation; and by a growth of the tube in length while the ends are confined, the small intestines are formed. The other internal organs are successively developed by similar processes.

The Stages of Growth.—At first insignificant in size,—a simple cell,—the embryonic human being steadily increases in size, gradually approximating more and more closely to the human form, until, at the end of about nine calendar months, or ten lunar months, the new individual is prepared to enter the world and begin a more independent course of life. The following condensation of a summary quoted by Dr. Austin Flint, Jr., will give an idea of the size of the developing being at different periods, and the rate of progress:—

At the end of the third week, the embryon is a little less than one-fourth of an inch in length.

At the end of the seventh week, it is three-fourths of an inch long. The liver, lungs, and other internal organs are partially formed.

At the eighth week, it is about one inch in length. It begins to look some like a human being, but it is impossible to determine the sex.

At the third month, the embryon has attained the length of two to two and one-half inches. Its weight is about one ounce.

At the end of the fourth month, the embryon is called a fetus. It is from four to five inches long, and weighs five ounces.

At the fifth month, the fetus is nearly a foot long, and weighs about half a pound.

At the sixth month, the average length of the fetus is about thirteen inches, and its weight one and a half to two pounds. If born, life continues but a few minutes.

At the seventh month, the fetus is from fourteen to fifteen inches long, and weighs two to three pounds. It is now viable (may live if born).

At the eighth month, the length of the fetus is from fifteen to sixteen inches, and its weight from three to four pounds.

At the ninth month, the fetus is about seventeen inches long, and weighs from five to six pounds.

At birth, the infant weighs a little more than seven pounds, the usual range being from four to ten pounds, though these limits are sometimes exceeded.

Duration of Gestation.—The length of time required for the development of a human being is usually reckoned as about forty weeks. A more precise statement places it at about two hundred and seventy-eight days. This limit is often varied from. Cases have occurred in which a much longer time has been required, and numberless cases have occurred in which human beings have been born several weeks before the expiration of the usual time, as stated. There is some uncertainty respecting the exact length of the period of gestation, which grows out of the difficulty of determining, in many cases, the exact time when conception takes place.

Uterine Life.—The uterine life of the new individual begins with the impregnation of the ovum, which occurs the instant it is

brought in contact with the zoösperms of the male. While in the uterus, the young life is supported wholly by the mother. She is obliged to provide not only for her own sustenance, but for the maintenance of her child. And she must not only eat for it, but breathe for it as well, since it requires a constant and adequate supply of oxygen before birth as much as afterward.

How the Unborn Infant Breathes.—Oxygen and nutriment are both supplied to it through the medium of an organ called the *placenta,* which is a spongy growth composed almost entirely of blood-vessels, and is developed upon the inner wall of the uterus, at the point at which the ovum attaches itself after fecundation. The growing fetus is connected with this vascular organ by means of a sort of cable, called the *umbilical cord.* The cord is almost entirely composed of blood-vessels, which convey the blood of the fetus to the placenta and return it again. The fetal blood does not mix with that of the mother, but receives oxygen and nourishment from it by absorption through the thin walls which alone separate it from the mother's blood.

The umbilical cord contains no nerves, as there is no nervous connection between the mother and the child. The only way in which the child can be influenced by the mother is through the medium of the blood, to changes in which it is very susceptible, as we shall see more clearly hereafter.

The cord is attached to the body of the child at the point called the *navel,* being cut off at birth by the *accoucheur.* With the placenta, it is expelled soon after the birth of the child, and constitutes the shapeless mass familiarly known as the *after-birth,* by the retention of which the most serious trouble is occasionally caused.

Parturition.—At the end of the period of development, the young being is forcibly expelled from the laboratory of nature in which it has been formed. In other words, it is born; and this process is termed *parturition.* Though, at first thought, such an act would seem an utter impossibility, yet it is a very admirable illustration of nature's adaptation of means to ends. During the months of gestation, while the uterus has been enlarging to accommodate its daily increasing contents, the generative passages have also been increasing in size and becoming soft and distensible, so that a seeming impossibility is in due time accomplished without physical damage,

though possibly not without intense suffering. However, it is a most gratifying fact that modern medical science may do much to mitigate the pains of childbirth. It is possible, by a proper course of preparation for the expected event, to greatly lessen the suffering usually undergone; and some ladies assert that they have thus avoided real pain altogether. Although the curse pronounced upon the feminine part of the race, in consequence of the sin of Eve, implies suffering in the parturient act, yet there is no doubt that the greater share of the daughters of Eve are, through the perverting and degenerating influences of wrong habits and especially of modern civilization, compelled to suffer many times more than their maternal ancestor. We have sufficient evidence of this in the fact that among barbarian women, who are generally less perverted physically than civilized women, childbirth is regarded with very little apprehension, since it occasions little pain or inconvenience. The same is true of many women among the lower laboring classes. In short, while it is true that more or less suffering must always accompany parturition, yet the excessive pain usually attendant upon the process is the result of causes which can in many cases be removed by proper management beforehand and at the time of confinement.

After being relieved of its contents, the uterus and other organs rapidly return to nearly their original size.

Changes in the Child at Birth.—In the system of the child a wonderful change occurs at the moment of its expulsion into the outer world. For the first time, its lungs are filled with air. For the first time, they receive the full tide of blood. The whole course of the circulation is changed, and an entirely new process begins. It is surprising in how short a space of time changes so marvelous can be wrought.

Nursing.—The process of development is not fully complete at birth. The young life is not yet prepared to support itself; hence, still further provision is necessary for it. It requires prepared food suited to its condition. This is provided by the *mammæ*, or breasts, of the female, which are glands for secreting milk. The fully developed gland is peculiar to the female; but a few instances have been known in which it has been sufficiently developed to become functionally active in men, as well as in young girls, though it is usually inactive even in women until near the close of gestation. It is a curious fact that the breasts of a new-born child occasionally contain milk.

The first product of the mammæ is not the proper milk secretion,

but is a yellowish fluid called *colostrum.* The true milk secretion begins two or three days after delivery.

The lacteal secretion is influenced in a very remarkable manner by the mental conditions of the mother. By sudden emotions of grief or anger, it has been known to undergo such changes as to produce in the child a fit of indigestion, vomiting, diarrhea, and even convulsions and death. Any medicine taken by the mother finds its way into the milk, and often affects the delicate system of the infant more than herself. This fact should be a warning to those nursing mothers who use stimulants. Cases are not uncommon in which delicate infants are kept in a state of intoxication for weeks by the use of alcoholic drinks by the mother. The popular notion that lager-beer, ale, wine, or alcohol in any other form, is in any degree necessary or beneficial to a nursing woman is a great error which cannot be too often noticed and condemned. Not only is the mother injured, instead of being benefited, by such a practice, but great injury, sometimes life-long in its consequences, is inflicted upon the babe at her breast that takes the intoxicating poison at second hand, and is influenced in a fourfold degree from its feebleness and great susceptibility.

Puberty.—For a certain period after birth, the sexual organs remain in a partially developed condition. This period varies in duration with different animals; in some cases being very brief, in others, comprising several years. Upon the attainment of a certain age, the individual becomes sexually perfect, and is then capable of the generative act. This period is called puberty. In man, puberty commonly occurs between the ages of ten and fifteen years, varying considerably in different climates. In this country, and in other countries of about the same latitude, puberty usually occurs at the age of fourteen or fourteen and one-half years in females, and a few months later in males. In cooler climates, as in Norway and Siberia, the change is delayed to the age of eighteen or nineteen years. In tropical climates it is hastened, occurring as early as nine or ten years. In warm climates it is no uncommon thing for a girl to be a mother at twelve; and it is stated that one of the wives of Mahomet was a mother at ten.

Other causes besides climate tend to hasten the occurrence of this change, as habits, temperament, constitutional tendency, education, and idiosyncrasy.

Habits of vigorous physical exercise tend to delay the access of puberty. For this reason, together with others, country boys and girls gen-

erally mature later by several months, and even a year or two, than those living in the city. Anything that tends to excite the emotions hastens puberty. The excitements of city life, parties, balls, theaters, even the competition of students in school, and the various causes of excitement to the nervous system which occur in city life, have a tendency to hasten the occurrence of the change which awakens the sexual activities of the system into life. Hence, these influences cannot but be considered prejudicial to the best interests of the individual, mentally, morally, and physically, since it is in every way desirable that a change which arouses the passions and gives to them greater intensity should be delayed rather than hastened.

Influence of Diet on Puberty.—The dietary has a not unimportant influence in this respect. Stimulating food, such as pepper, vinegar, mustard, spices, and condiments generally, together with tea and coffee, and an excess of animal food, have a clearly appreciable influence in inducing the premature occurrence of puberty. On this account, if on no other, should these articles be prohibited to children and youth, or used very sparingly. Those who advocate the large use of meat by children and youth have not studied this matter closely in all its bearings. While it is true that children and growing youth require an abundance of the nitrogenous elements of food, which are found abundantly in beefsteak, mutton, fish, and other varieties of animal food, it is also true that in taking those articles of food they take along with the nutrient elements properties of a stimulating character, which exert a decidedly detrimental influence upon the susceptible systems of children and youth. At the same time, it is possible to obtain the same desirable nitrogenous elements in oatmeal, unbolted wheat flour, peas, beans, and other vegetable productions, which are wholly free from injurious properties. We are positive from numerous observations on this subject, that a cool, unstimulating, vegetable or farinaceous diet would deter the development of the sexual organism for several months, and perhaps for a year or two.

While it may not be in all cases desirable to do this, it would at least be wise to adopt such measures in cases in which the child is unavoidably exposed to influences which have a tendency to hasten the change

It is important to add in this connection a word of caution against the adoption of a dietary too abstemious in character. It is necessary that an abundance of good, wholesome food, rich in the elements of nutrition, should be taken regularly. There is no doubt that many young ladies have induced conditions of serious disease by actual starvation of

the system. A young woman who attempts to live on strong tea or coffee, fine-flour bread, and sweet-cake, is as certainly starving herself as though she were purposely attempting to commit suicide by means of starvation, and with as much certainty of the same result.

Cases occasionally occur in which puberty makes its appearance at the age of three or four years. Indeed, a case has been reported in this country in which a female child possessed all the characteristics which are usually developed at puberty, from birth. In this case the regular periodical changes began at birth.

Premature Development Occasions Early Decay.—A fact which is of too great importance to allow to pass unnoticed, is that whatever occasions early or premature sexual development, also occasions premature decay. Females in whom puberty occurs at the age of ten or twelve, by the time this age is doubled, are shriveled and wrinkled with age. At the time when they should be in their prime of health and beauty, they are prematurely old and broken. Those women who mature late retain their beauty and their strength many years after their precocious sisters have become old, decrepit, and broken down. Thus, the matrons of thirty and forty years in colder climates are much more attractive in appearance than the maidens of sixteen; while quite the reverse is true in this and other countries where sexual development is unduly hastened.

The unnaturally early appearance of puberty is a just cause for apprehension, since it usually indicates an inherent weakness of the constitution. When there are reasons for fearing its occurrence, active measures should be taken to occasion delay if possible. We call especial attention to this point, since there are many who erroneously suppose the early occurrence of puberty to be a sign of superior vigor.

Changes which Occur at Puberty.—The changes which occur in the two sexes at this period have been thus well described :—

"In both sexes, hair grows on the skin covering the *symphysis pubis*, around the sexual organs, and in the axillæ (armpits). In man, the chest and shoulders broaden, the larynx enlarges, and the voice becomes lower in pitch from the elongation of the vocal cords; hair grows upon the chin, upper lip, and cheeks, and often exists upon the general surface of the body more abundantly than in woman." The sexual organs undergo enlargement, and are more frequently excited. The testicles first begin the secretion of the seminal fluid.

"In woman, the pelvis and abdomen enlarge, but the whole frame

remains more slender, the muscles and joints less prominent, the limbs more rounded and tapering [than in the male]. Locally, both external and internal organs undergo a considerable and rapid enlargement. The mammæ enlarge, the ovarian vesicles become dilated, and there is established a periodical discharge of one or more ova, accompanied, in most cases, by a sanguineous fluid from the cavity of the uterus."

These changes, so varied and extraordinary, often occur within a very short space of time; and as they are liable to serious derangement, especially in the female, great care should be taken to secure for the individual the most favorable conditions until they are successfully effected. It is, however, a fact deserving of mention, that many of the ills which are developed at this particular period are quite as much the result of previous indiscretions and mismanagement as of any immediate cause. A few suggestions with regard to the proper treatment of individuals at this age may be in place.

1. Do not allow the boy or girl to be overworked, either mentally or physically. Great and important changes are occurring within the body, and nature should not be overtaxed.

2. Keep the mind occupied. While excessive labor should be avoided, idleness should be as carefully shunned. Some light, useful employment or harmless amusement—better some kind of work—should keep the mind fully occupied with wholesome subjects.

3. Abundant exercise out-of-doors is essential for both sexes. Sunshine and fresh air are as necessary to the development of a human being as for the expanding of a flower bud.

4. Watch carefully the associations of the youth. This should be done at all times, but especially just at the critical period in question, when the general physical disturbances occurring in the system react upon the mind and make it peculiarly susceptible to influences, especially those of an evil character.

5. None too much care can be exercised at this important epoch of human life, provided it is properly applied; but nothing could be more disastrous in its consequences than a weak solicitude which panders to every whim and gratifies every perverted appetite. *Such* care is a fatal error.

Menstruation.—The functional changes which occur in the female are much more marked than those of the male. As already intimated, the periodical development and discharge of an ovum by the female, which occurs after puberty, is accompanied by the discharge of a bloody

fluid, which is known as the *flowers, menses*, or *catamenia*. The accompanying symptoms together are termed the process of *menstruation*, or *being unwell*. This usually occurs, in the human female, once in about four weeks. In special cases, the interval may be a week less or a week longer; or the variation may be even greater. Dalton describes the process as follows:—

"When the expected period is about to come on, the female is affected by a certain degree of discomfort and lassitude, a sense of weight in the pelvis, and more or less disinclination to society. These symptoms are in some cases slightly pronounced, in others more troublesome. An unusual discharge of vaginal mucus then begins to take place, which soon becomes yellowish or rusty brown in color, from the admixture of a certain proportion of blood; and by the second or third day, the discharge has the appearance of nearly pure blood. The unpleasant sensations which were at first manifest, then usually subside; and the discharge, after continuing for a certain period, begins to grow more scanty. Its color changes from a pure red to a brownish or rusty tinge, until it finally disappears altogether, and the female returns to her ordinary condition."

The menstrual function continues active from puberty to about the forty-fifth year, or during the period of fertility. When it finally disappears, the woman is no longer capable of bearing children. The time of disappearance is termed the "change of life," or *menopause*. Exceptional cases occur in which this period is greatly hastened, arriving as early as the thirty-fifth year, or even earlier. Instances have also been observed in which menstruation continued as late as the sixtieth year, and even later; but such cases are very rare; and if procreation occurs, the progeny is feeble and senile.

With rare exceptions, the function is suspended during pregnancy, and usually, also, during the period of nursing.

Nature of Menstruation.—There has been a great amount of speculation concerning the cause and nature of the menstrual process. No entirely satisfactory conclusions have been reached, however, except that it is usually accompanied by the maturation and expulsion from the ovary of an ovum, which is termed ovulation. But menstruation may occur without ovulation, and *vice versa*.

Menstruation is not peculiar to the human female, being represented in the higher animals by what is familiarly termed the "rut." This is not usually a bloody discharge, however, as in the human female, though such a discharge has been observed in the monkey.

It has been quite satisfactorily settled that the discharge of the ovum from the ovary generally takes place about the time of the cessation of the flow. Immediately after the discharge, the sexual desires of the female are more intense than at other times. This fact is particularly manifest in lower animals. The following remark by Prof. Dalton is especially significant to those who care to appreciate its bearing:—

"It is a remarkable fact, in this connection, that the female of these [domestic] animals will allow the approaches of the male only during and immediately after the œstrual period [rut]; that is, just when the egg is recently discharged, and ready for impregnation. At other times, when sexual intercourse would be necessarily fruitless, the instinct of the animal leads her to avoid it; and the concourse of the sexes is accordingly made to correspond in time with the maturity of the egg and its aptitude for fecundation."

The amount of fluid lost during the menstrual flow varies greatly with different individuals. It is estimated at from three ounces to half a pint. In cases of deranged function, it may be much greater than this. It is not all blood, however, a considerable portion being mucus. It is rather difficult to understand why the discharge of so considerable a quantity of blood is required. There is no benefit derived from a very copious discharge, as some suppose. Facts seem to indicate that in general those enjoy the best health who lose but small quantities of blood in this manner.

As the first occurrence of menstruation is a very critical period in the life of a female, and as each recurrence of the function renders her especially susceptible to morbid influences, and liable to serious derangements, a few hints respecting the proper care of an individual at these periods may be acceptable.

Important Hints.—1. Avoid taking cold. To do this, it is necessary to avoid exposure; not that a person must be constantly confined in a warm room, for such a course would be the surest way in which to increase the susceptibility to cold. Nothing will disturb the menstrual process more quickly than a sudden chilling of the body when in a state of perspiration, or after confinement in a warm room, by exposure, without sufficient protection, to cold air. A daily bath and daily exercise in the open air are the best known means of preventing colds.

2. Intense mental excitement, as well as severe physical labor, is to be sedulously avoided during this period. At the time of its first

occurrence, special care should be observed in this direction. Intense study, a fit of anger, sudden grief, or even great merriment, will sometimes arrest the process prematurely. The feeling of *malaise* which usually accompanies the discharge is by nature intended as a warning that rest and quiet are required; and the hint should be followed. Every endeavor should be made to keep the individual comfortable, calm, and cheerful. Feelings of apprehension arising from a continual watching of symptoms are very depressing, and should be avoided by occupying the mind in some agreeable manner not demanding severe effort, either mental or physical.

There is no doubt that many young women have permanently injured their constitutions while at school by excessive mental taxation during the catamenial period, to which they were prompted by ambition to excel, or were compelled by the "cramming" system too generally pursued in our schools, and particularly in young ladies' seminaries. It is not to be supposed, however, that the moderate amount of sound study required by a correct system of teaching would be injurious to a healthy young woman at any time, and we have no doubt that a very large share of the injury which has been attributed to overstudy during the catamenia, has been induced by other causes, such as improper dress, exposure to taking cold, keeping late hours, and improper diet.

If there is any class of persons deserving of pity it is that large class of girls and young women who are in every large city employed as clerks, seamstresses, flower-makers, and in other taxing and confining occupations. In order to keep their situations they are required to be on hand daily, being allowed no opportunity for rest at the menstrual period. In many cases, too, they are compelled to remain upon their feet all day behind a counter, or at a work table, even at periods when a recumbent position is actually demanded by nature. There should be less delicacy in relation to this subject on the part of young women, and more consideration on the part of employers. Here is a field for philanthropic labor which is well worthy of the best efforts of any person of influence who will engage in it.

Custom of Indian Women.—The ease with which Indian women perform the parturient act is proverbial. They suffer scarcely at all from the pains of childbirth; and without doubt one reason of this is the preservation of their sexual health by rest during the menstrual period. At those seasons they invariably absent themselves from the

lodge, and enjoy absolute rest. We may readily suppose, from the nature of some of the Mosaic laws, that a custom somewhat similar prevailed among the ancient Hebrew women. If the hardy women of the forest are benefited by rest, certainly our more delicate females may be thus benefited. All need a degree of rest; with some it should be absolute.

The reckless manner in which some young women treat themselves at the menstrual period, is quite appalling to one who is acquainted with the painful and inveterate character of the evils which arise from such abuse. It is no uncommon thing for young ladies to attend balls, visit skating rinks, and otherwise expose themselves to influences in every way the best calculated to do them the most harm at this particular period, observing not the slightest precaution. Such recklessness is really criminal, and the sad consequences of physical transgression are sure to follow. A young lady who allows herself to get wet or chilled, or gets the feet wet, just prior to or during menstruation, runs the risk of imposing upon herself life-long injury. Mothers should look carefully after their daughters at these periods, and impress upon them the importance of special care.

3. A third hint, which is applicable to both sexes and at all times, is the necessity of attending promptly to the demands of nature for relief of the bowels and bladder. School-girls are often very negligent in this respect; and we have seen the most distressing cases of disease which were entirely attributable to this disregard of the promptings of nature. Obstinate constipation and chronic irritation of the bladder are common effects. When constipation results, purgatives in the shape of pills, salts, or "pleasant purgative pellets," are resorted to with the certain result of producing only temporary relief, and permanent damage.

To escape these evil consequences, do this: 1. Establish a regular habit of relieving the bowels daily at a certain hour; 2. Discard laxative and cathartic drugs of every kind; 3. To aid in securing a regular movement of the bowels, make a liberal use of oatmeal, wheat-meal, fruit, and vegetables, avoiding fine-flour bread, sweetmeats, and condiments; 4. Take daily exercise, as much as possible short of fatigue; if necessarily confined in-doors, counteract the constipating influence of sedentary habits by kneading and percussing the bowels with the hands several minutes each day; 5. Never resist the calls of nature a single moment, if possible to avoid it. In this case, as in

numerous others, "delay is dangerous." Ladies who desire a sweet breath — and what lady does not? — should remember that retained feces is one of the most frequent causes of foul breath. The foul odors which ought to pass out through the bowels find their way into the blood and escape at the lungs.

It is of the greatest importance that careful attention should be given to the proper establishment of the menstrual function at the outset of a woman's life of sexual activity. The first two years will be quite likely to have a deciding influence respecting her health during her whole future life. If a woman can get through the first two years after puberty without acquiring any serious uterine or ovarian disease, she will stand a good chance of enjoying a good degree of sexual health during the balance of her life. The foundation of a great share of the many thousands of cases of uterine disease is laid during this period.

At this early period the daughter is usually too young to appreciate the importance of observing slight deviations from the standard of health, even if she were able to recognize them. Hence it is a duty which no mother should neglect, to inquire into the exact frequency of the periods, the amount and character of the discharge, and other points necessary to ascertain whether or not there is any deviation from the natural condition of health. If there is pain, it is a certain evidence of something seriously wrong. If there is irregularity in any particular, it is a matter well deserving of serious attention.

Extra-Uterine Pregnancy.—Sometimes the ovum becomes fecundated before reaching the uterus, and instead of passing onward into that organ as usual, remains in its position in the Fallopian tube or even on the surface of the ovary. Occasionally an ovum falls into the cavity of the abdomen instead of passing into the tube. Even in this situation it may be fecundated. Impregnated ova, thus left in abnormal positions, sometimes undergo a greater or lesser degree of development. They often result in the death of the mother.

Twins.—The human female usually matures but one ovum at each menstrual period, the two ovaries acting alternately. Occasionally two ova are matured at once. If fecundation occurs, the result will be a development of two embryos at the same time. In rare cases, three or even four ova are matured at once, and by fecundation produce a corresponding number of embryos. As many as five children have been born alive at one birth, but have not usually lived more than a few minutes.

Monsters.—Defects and abnormalities in the development of the embryon produce all degrees of deviation from the typical human form. Excessive development may result in an extra finger or toe, or in the production of some peculiar excrescence. Deficiency of development may produce all degrees of abnormality from the simple harelip to the most frightful deficiency, as the absence of a limb, or even of a head. It is in this manner that those unfortunate individuals known as her-

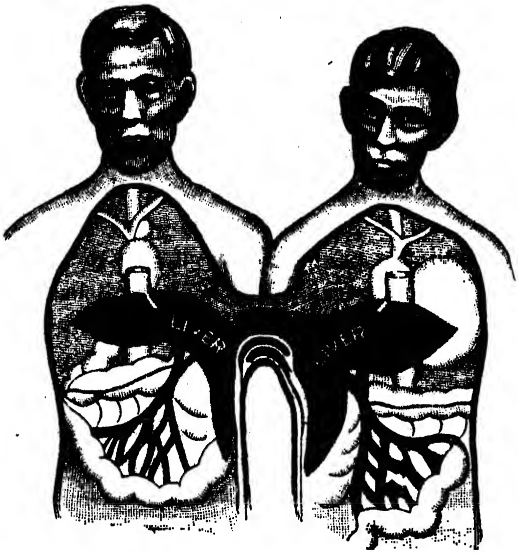


Fig. 139. Chang and Eng, the Siamese Twins.

maphrodites are formed. An excessive development of some parts of the female generative organs gives them a great degree of similarity to the external organs of the male. A deficient development of the masculine organs renders them similar in appearance to those of the female. Excessive development shown in a peculiar manner produces both kinds of organs in the same individual in a state more or less complete.

The uncouth shapes which are sometimes supposed to be the result of amalgamation with lower animals are produced in essentially the same manner. The stories which are frequently told of women giving birth to puppies and other animals have no foundation other than that mentioned.

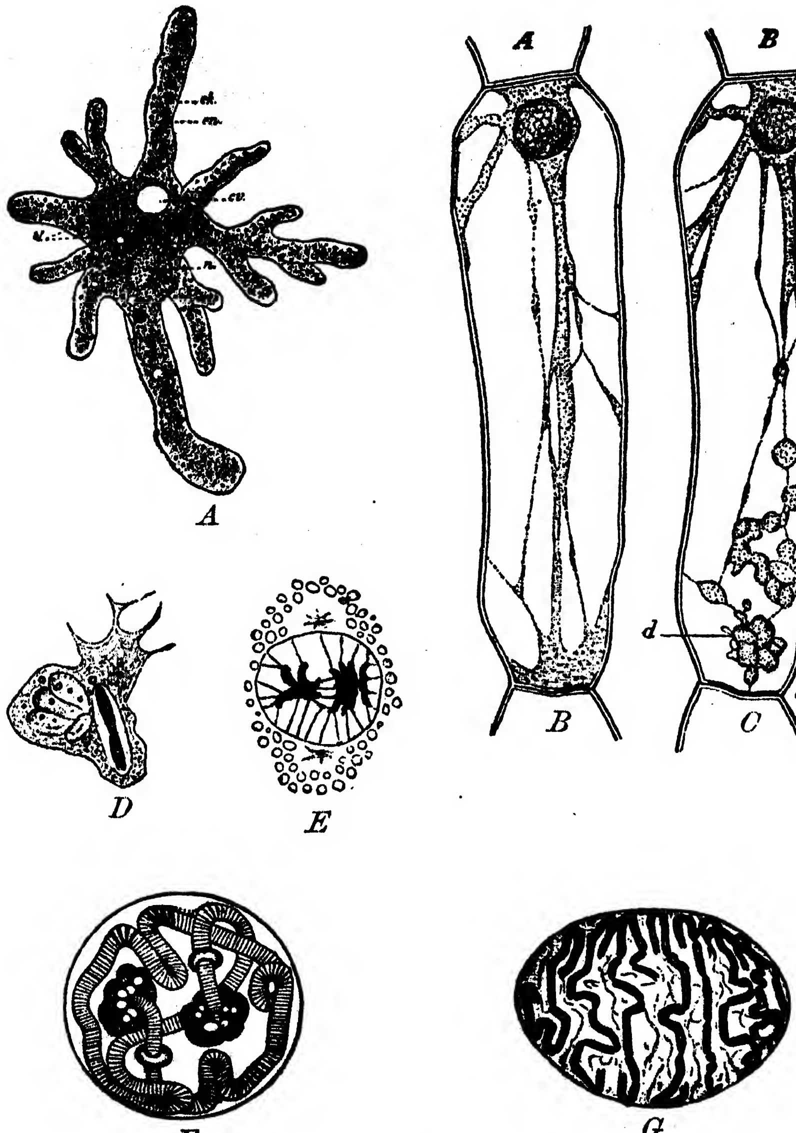
Such curious cases as the Carolina twins and Chang and Eng were formerly supposed to be the result of the union of two separate individuals. It is now believed that they are developed from a single ovum.

Hybrids.—It is a well-known law of biology that no progeny result from union of animals of different species. Different varieties of the same species may in some cases form a fertile union, the result of which is a cross between its two parents, possessing some of the qualities of each. The mule is the product of such a union between the horse and the ass. A curious fact is that the offspring of such unions are themselves sterile almost without exception. The reason of this is that they do not produce mature elements of generation. In the mule the zoösperms are either entirely absent or else very imperfectly developed ; hence the fact that a colt having a mule for its sire is one of the rarest of curiosities, though a few instances have been reported. This is a wise law of nature to preserve the purity of species.

Law of Sex.—If there is a law by which the sex of the developing embryon is determined, it probably has not yet been discovered. The influence of the will, the predominant vitality of one or the other of the parents, and the period at which conception occurs, have all been supposed to be the determining cause. A German physician some time since advanced the theory that the two testicles and ovaries produce elements of different sexual character, the right testicle forming zoösperms capable of producing only males, and the right ovary producing ova with the same peculiarity. The left testis and the left ovary he supposed to form the female elements. He claimed to have proved his theory by experiments upon animals. Even if true, this theory will not be made of practical importance. It is, in fact, nothing more than a revival of an old theory held by physicians who flourished more than two thousand years ago.

More recently, another German physician has advanced the theory that the sex may be controlled at will by observing the time of fecundation. He asserts that when fecundation occurs shortly after menstruation, the result will be a female ; but if impregnation occurs later in the month, and prior to the three or four days preceding the next menstrual period, a male will almost certainly be produced. This theory was proposed by Prof. Thury of the academy of Geneva, who claims to have thoroughly tested it in a great variety of ways, and always with an affirmative result.

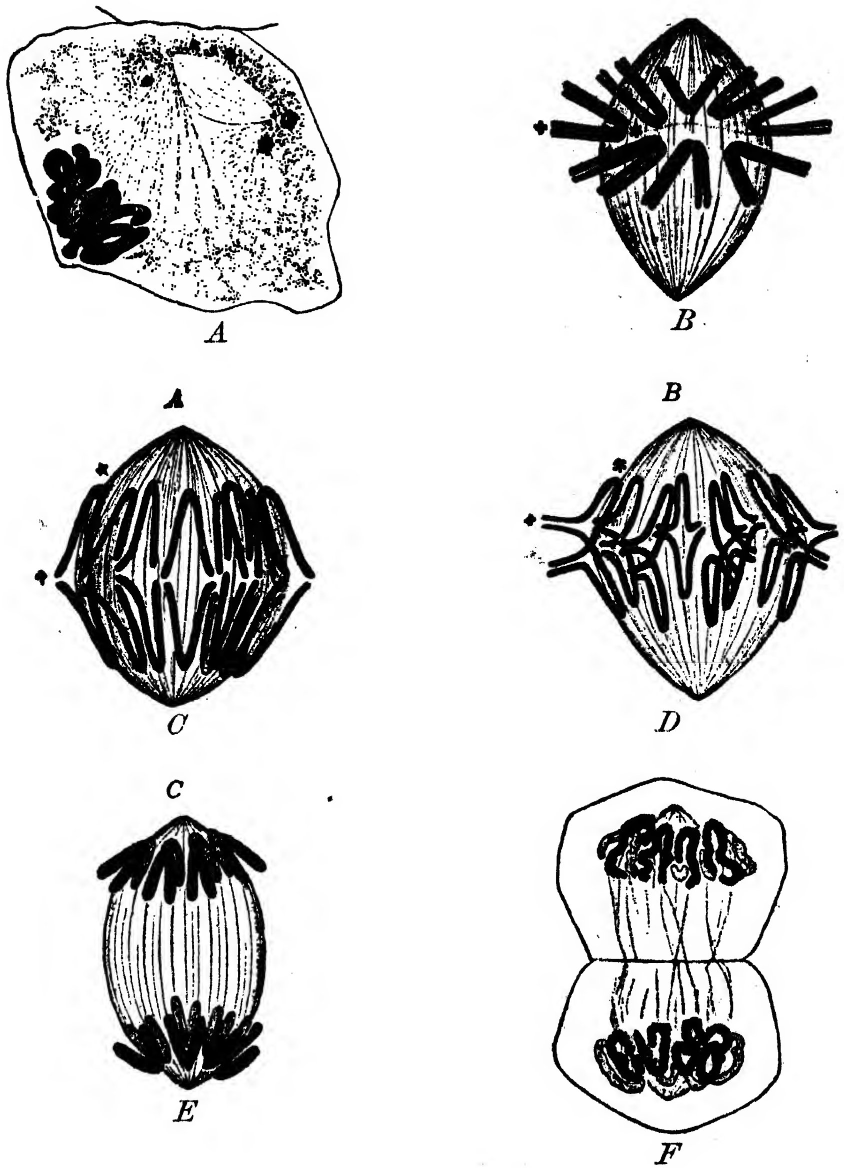
Heredity.—The phenomena of heredity are among the most interesting of biological studies. It is a matter of common observation that a child looks like its parents. It even happens that a child resembles an uncle or a grandparent more nearly than either parent. The same peculiarities are often seen in animals.



(After Hertwig.)

PLATE G.

A. Amœba — lowest form of animal life.
B. Cell of a vegetable hair, showing current of protoplasm.
C. Appearance of protoplasm after irritation.
D. White corpuscle of a frog digesting a microbe.
E. Reproductive cell of ascaris preparing for division.
F. Nucleus of a cell from the salivary gland of chironomus.
G. Cell (salamander) showing beginning of longitudinal division.



(After Hertwig.)

PLATE II.—THE PHENOMENA OF CELL DIVISION, AS DEMONSTRATED BY FLEMMING.

A. Cell of salamander preparing to divide.
B. First grouping of segments of nucleus.
C. *D*. *E*. Successive stages in the segmentation and grouping of the nuclear filaments.
F. New nuclei forming: division nearly complete.

The cause of this resemblance of offspring to parents and ancestors has been made a subject of careful study by scientific men. Numerous theories have been proposed whereby to account for the marvelous phenomena of heredity, in which we see not only race characteristics transmitted, but also those which have been acquired. Much progress has recently been made in explaining the phenomena of heredity. Sexual characteristics and fecundation are very closely connected with heredity, and must be considered with it for a clear comprehension of the modern views upon this subject. Biology regards the body of a living being, whether animal or vegetable, as simply an aggregation of cells; cells multiply by the division of minute bodies contained within them known as nuclear fibrils, which break up into small rods, the number of which is always the same for each animal species. These rods, known as chromosomes, when formed by division, assume the shape of the letter V, and arrange themselves in a regular manner in the center of the cell, forming what is termed the equatorial plate. The next step is the division of each individual chromosome, which splits longitudinally, thus doubling the number of chromosomes. The two sets of chromosomes thus formed separate, and arrange themselves in rings, each chromosome facing its partner upon the opposite side. At the same time there appears, a little to one side, a small colorless globule called the centrosome. This globule, like the chromosome, splits in two, and the two halves likewise move to opposite sides of the nucleus in which this marvelous process is taking place. The two centrosomes soon become connected by fine fibrils extending from one to the other, and arranged in such a manner as to give the appearance of a spindle. Next the chromosomes move toward the centrosomes, the individual chromosomes in each set attach themselves to each other, end to end, thus reproducing the nuclear fibrils and forming two new nuclei, each of which contains precisely the same number of chromosomes as the original nucleus. The protoplasm of the cell surrounding the nucleus then divides at a point between the two nuclei, and two new cells, known as daughter cells, are formed. This process is known as karyokinesis.

The marvelous behavior of the cell elements in this process of division speaks in stronger terms than any argument could do of the existence of an intelligent power, unseen but everywhere present, acting in and through the minutest of living organisms.

In the process of cell division just described, the two groups of divided chromosomes each joins one of the centrosomes. It thus appears that each daughter cell contains exactly one-half of the mother cell.

In the formation of a sexual cell, the process is precisely the same. The female cell, or ovule, however, is not a complete cell, and it is for this reason that it must be joined to a male cell, or spermatozoön, before development or growth can take place; in other words, it must be fecundated.

In the development of the ovule, one-half of the chromosomes are converted into what is called an extrusion-globule, leaving in the nucleus of the cell only half of the original nuclear fibrils, or the female portion of the cell. This is what constitutes an egg.

The spermatozoön, or fecundating cell, consists of three parts: the head, which is equivalent to a nucleus; the neck, which represents the centrosome; and the tail. After the spermatozoön penetrates the egg, its three parts separate. The head develops to form a nucleus, and the neck forms the centrosome, or spermocentre. The nuclear fibrils of the nucleus break up into chromosomes, the same as those of the egg. The egg centrosome, or ovacentre, and the spermocentre then approach as though they were drawn by mutual attraction. They meet and unite, but do not lose their individual identity. In uniting in this manner, they form the embryo nucleus. At this stage, the ovacentre is at one pole, and the spermocentre at the other pole. At the next stage, each of the centrosomes divides, and the two halves recede from each other, moving out from the center of the cell in opposite directions. Proceeding along the circumference of the cell, the individual halves meet in such a manner that the chromosomes of different origin are brought together and made to unite. After this takes place, the centrosomes are no longer sexually different, one being male, the other female, but each contains exactly one-half of each of the elements, and so is both male and female. The egg, by the expulsion of one-half its chromosomes, loses its power to grow or develop. This power is restored by fecundation, whereby an equal number of chromosomes is restored to it, though from a different cell.

The spermatozoön, like the ovum, is an incomplete cell, and also incapable of growth; but by the union of the two, the spermatozoön and the ovum, a complete cell is formed.

The ovum, when fecundated by a spermatozoön, is thereby endowed with generative power, which it receives by heredity. Weissmann, who has recently published an ingenious and interesting work on heredity, regards the body as consisting of two classes of cells; one class charged with the functions of nutrition and coordination, the other with the duty of propagating the species, the so-called sexual cells. By this means, the body is divided into two portions, the somatic and the generative. These two portions of the animal body are regarded as biologically independent. This view considers that in the division, or segmentation, of a fecundated ovum, the germinating substance connected with certain cells is destined to form the somatic portion of the body, the cells being set aside for that purpose. In the same manner, other cells are set aside to constitute the generative part of the body.

Heredity is the result of the fact that living matter is deathless, in a certain sense, since a descendant is always developed from a portion of his ancestor. This is why we resemble our parents, and more remote ancestors.

The male and the female cells contain equivalent quantities of the nuclear substance, their only difference being that they are derived from different individuals. The object of fecundation is evidently to secure variation. Sex originates in the fact that a single-cell nucleus does not possess a sufficient amount of vital energy for perpetual reproduction. It is necessary that the nucleus should be rejuvenated, or brought in contact with another nucleus, whereby it borrows a new lease of life. The eminent French anatomist, De Bierre, who has written ably upon this subject, remarks as follows, referring to the above facts: "Males and females, consequently, have not been made for mutual pleasure; man has not been created in order to 'court' woman, nor woman for the purpose of 'flirting' with man." The purpose of the generative function is thus clearly shown to be the preservation of the race and the individual, and not mere animal gratification.

The accompanying plates (Plates G and H) present a most graphic picture of the behavior of reproductive cells under the mysterious impulse of life. It must seem to the scientific microscopist engaged in studying this marvelous process, that he can almost see the divine Artist at work in the infinitely minute recesses of life which the microscope reveals, and that he can almost discern the

marshaling of molecules, the ordering of atoms, and hear the divine harmonies to which their movements are tuned.

Ante-Natal Influences.— There can be no manner of doubt that many circumstances which it is entirely within the power of the parents to supply, exert a powerful influence in moulding both the mental and the physical characteristics of offspring. By carefully availing himself of the controlling power given him by a knowledge of this fact, the stock raiser is enabled to produce almost any required quality in his young animals. Pigeon fanciers show wonderful skill in thus producing most curious modifications in birds. The laws of heredity and development are carefully studied and applied in the production of superior horses, cows, dogs, and pigeons; but an application of the same principles to the improvement of the human race is rarely thought of. Human beings are generated in as haphazard and reckless a manner as weeds are sown by the wind. No account is taken of the possible influence which may be exerted upon the future destiny of the new being by the physical or mental condition of parents at the moment when the germ of life is planted, or by the mental and physical conditions and surroundings of the mother while the young life is developing. Indeed, the assertion of a modern writer that the poor of our great cities virtually "spawn children," with as little thought of influences and consequences as the fish that sow their eggs broadcast upon the waters, is not so great an exaggeration as it might at first sight appear to be.

Men and women are constantly prone to forget that the domain of law is universal. Nothing comes by chance. The revolutions of the planets, studied by the aid of the telescope, and the gyrations of the atoms, seen only by the eye of science, are alike examples of the controlling influence of law. Notwithstanding this sad ignorance and disregard of this vitally important subject, the effects of law are only too clearly manifested in the crowds of wretched human beings with which the world is thronged. An old writer sagely remarks, "It is the greatest part of our felicity to be well born;" nevertheless, it is the sad misfortune of by far the greater portion of humanity to be deprived of this inestimable "felicity."

Prof. O. W. Holmes remarks on this subject: "There are people who think that everything may be done if the doctor, be he educator or physician, be only called in season. No doubt; but *in season* would often be a hundred or two years before the child was born, and people never send so early as that." "Each of us is only the footing up of a double

column of figures that goes back to the first pair. Every unit tells, and some of them are *plus* and some *minus*. If the columns don't add up right, it is commonly because we can't make out all of the figures."

It cannot be doubted that the throngs of deaf, blind, crippled, idiotic unfortunates who were "born so," together with a still larger class of dwarfed, diseased, and constitutionally weak individuals, are the lamentable results of the violation of some sexual law on the part of their progenitors.

SEXUAL HYGIENE.

Under this head we will consider some of the more general subjects relating to the health of the reproductive organism which have not been considered in connection with the special organs and functions described.

The *use* of the reproductive function is perhaps the highest physical act of which man is capable; its *abuse* is certainly one of the most grievous outrages against nature which it is possible for him to perpetrate. No observing person can doubt that the sexual relations of men and women determine in a great degree their happiness or misery in life. This subject, then, deserves due attention and careful consideration. It is of no use to scout it; for it will inevitably obtrude itself upon us, no matter how sedulously we attempt to avoid it. It can be rightly considered only with the most perfect candor, with the mind unbiased by passion, and prayerfully anxious to know and *do* what is right.

In the following paragraphs of this section are considered some of the evils out of which grows much of the sexual suffering of men and women:—

Sexual Precocity.—There are two periods in human life when the sexual instincts should be totally dormant; and they are so when nature is not perverted. The first is the period reaching from infancy to puberty. The second is the period reached in advanced age.

If raised strictly in accordance with natural law, children would have no sexual notions or feelings before the occurrence of puberty. No prurient speculation about sexual matters would enter their heads. Until that period, the reproductive system should lie dormant in its undeveloped state. No other feeling should be exhibited between the sexes than that brotherly and sisterly affection which is so admirable and becoming.

We have been not more disgusted than shocked to see parents, whose intelligence ought to teach them better, not only winking at,

but actually encouraging, premature manifestations of passion in their children. They may yet learn, by bitter experience, the folly of their course, unless they make the discovery in time to avert, by careful reformatory training, the calamitous results which threaten the future of their children.

Chastity.—In Ex. 20 : 14 and Matt. 5 : 28 we have a complete definition of chastity. The seventh commandment, with the Saviour's commentary upon it, places clearly before us the fact that chastity requires purity of thought as well as of outward acts. Impure thoughts and unchaste acts are alike violations of the seventh commandment. As we shall see, also, unchastity of the mind is a violation of natural law as well as of moral law, and is visited with physical punishment commensurate to the transgression.

Mental Unchastity.—It is vain for a man to suppose himself chaste who allows his imagination to run riot amid scenes of amorous associations. The man whose lips delight in tales of licentiousness, whose eyes feast upon obscene pictures, who is ever ready to pervert the meaning of a harmless word or act into uncleanness, who finds delight in reading vivid portrayals of acts of lewdness,—such a one is not a virtuous man.

Man may not see these mental adulteries, he may not perceive these filthy imaginings; but One sees and notes them. They leave their hideous scars upon the soul. They soil and mar the mind; and as the record of each day of life is photographed upon the books in Heaven, they each appear in bold relief, in all their innate hideousness.

Foul thoughts once allowed to enter the mind, stick like the leprosy. They corrode, contaminate, and infect like the pestilence; naught but Almighty power can deliver from the bondage of concupiscence a soul once infected by this foul blight, this moral contagium.

It is a wide-spread and deadly error, that only outward acts are harmful; that only physical transgression of the laws of chastity will produce disease. We have seen all the effects of beastly abuse result from mental sin alone.

"I have traced serious affections and very great suffering to this cause. The cases may occur at any period of life. We meet with them frequently among such as are usually called, or think themselves, continent young men. There are large classes of persons who seem to think that they may, without moral guilt, excite their own feelings or those of others by loose or libidinous conversation in soci-

ety, provided such impure thoughts or acts are not followed by masturbation or fornication. I have almost daily to tell such persons that physically, and in a sanitary point of view, they are ruining their constitutions. There are young men who almost pass their lives in making carnal acquaintances in the street, but just stop short of seducing girls; there are others who haunt the lower class of places of public amusement for the purpose of sexual excitement, and live, in fact, a thoroughly immoral life in all respects except actually going home with prostitutes. When these men come to me, laboring under the various forms of impotence, they are surprised at my suggesting to them the possibility of the impairment of their powers being dependent upon these previous vicious habits."*

"Those lascivious *day-dreams* and amorous reveries, in which young people—and especially the idle and the voluptuous, and the sedentary and the nervous—are exceedingly apt to indulge, are often the sources of general debility, effeminacy, disordered functions, premature disease and even premature death, without the actual exercise of the genital organs; indeed, this unchastity of thought—this adultery of the mind—is the beginning of immeasurable evil to the human family." †

"Filthy dreamers," before they are aware, become filthy in action. The thoughts mold the brain, as certainly as the brain molds the thoughts. Rapidly down the current of sensuality is swept the individual who yields his imagination to the contemplation of lascivious themes. Before he knows his danger, he finds himself deep in the mire of concupiscence. He may preserve a fair exterior; but deception cannot cleanse the slime from his putrid soul. How many a church member carries under a garb of piety a soul filled with abominations, no human scrutiny can tell. How many pulpits are filled by "whited sepulchers," only the Judgment will disclose.

Early Causes.—The earliest of all causes is hereditary predisposition. As we have shown, a child conceived in lust can no more be chaste by nature than a negro can be a Caucasian. But back of this there is a deeper cause, as we shall see, one that affects parents as well as offspring. Between infancy and puberty, are in operation all those influences mentioned under "Sexual Precocity."

The frequent custom of allowing children of opposite sex to

* Acton. † Graham.

sleep together, even until eight or ten years of age, or longer, is a dangerous one. We have known of instances in which little boys of seven or eight have been allowed to sleep with girls of fourteen or sixteen, in some of which most shameful lessons were taught, and by persons who would not be suspected of such an impropriety. In one instance a little boy of eight, occupying the same bed with three girls several years older, was used for illustration by the older girl in instructing the younger ones in the *modus operandi* of reproduction. The sexes should be carefully separated from each other at least as early as four or five years of age, under all circumstances which could afford opportunity for observing the physical differences of the sexes, or in any way serve to excite those passions which at this tender age should be wholly dormant.

Diet vs. Chastity.—From earliest infancy to impotent old age, under the perverting influence of civilization, there is a constant antagonism between diet and purity. When old enough to take food in the ordinary way, the infant's tender organs of digestion are plied with highly seasoned viands, stimulating sauces, animal food, sweetmeats, and dainty tidbits in endless variety. Soon, tea and coffee are added to the list. Salt, pepper, ginger, mustard, condiments of every sort, deteriorate his daily food. If, perchance, he does not die at once of indigestion, or with his weakened forces fall a speedy victim to the diseases incident to infancy, he has his digestive organs impaired for life at the very outset of his existence.

Exciting stimulants and condiments weaken and irritate his nerves and derange the circulation. Thus, indirectly, they affect the sexual system, which suffers through sympathy with the other organs. But a more direct injury is done. Flesh, condiments, eggs, tea, coffee, chocolate, and all other stimulants, have a powerful influence directly upon the reproductive organs. They increase the local supply of blood; and through nervous sympathy with the brain, the passions are aroused.

Overeating, eating between meals, hasty eating, eating indigestible articles of food, late suppers, react upon the sexual organs with the utmost certainty. Any disturbance of the digestive function deteriorates the quality of the blood. Poor blood, filled with crude, poorly digested food, is irritating to the nervous system, and especially to those extremely delicate nerves which govern the reproductive function. Irritation provokes congestion; congestion excites sexual de-

sires; excited passions increase the local disturbance; and thus each reacts upon the other, ever increasing the injury and the liability to future damage.

Thus, these exciting causes continue their insidious work through youth and more mature years. Right under the eyes of fathers and mothers they work the ruin of their children, exciting such storms of passion as are absolutely uncontrollable.

Tobacco and Vice.—Few are aware of the influence upon morals exerted by that filthy habit, tobacco-using. When acquired early, it excites the undeveloped organs, arouses the passions, and in a few years converts the once chaste and pure youth into a veritable volcano of lust, belching out from its inner fires of passion torrents of obscenity and the sulphurous fumes of lasciviousness. If long-continued, the final effect of tobacco is emasculation; but this is only the necessary consequence of previous super-excitation.

We are aware that we have made a grave charge against tobacco, and we have not hesitated to state the naked truth; yet we do not think we have exaggerated, in the least, the pernicious influence of this foul drug. As much might be said against the use of liquor on the same grounds.

Bad Books.—Another potent enemy of virtue is the obscene literature which has flooded the land for many years. Circulated by secret agencies, these books have found their way into the most secluded districts. Every large school contains one or more of these emissaries of evil men and their Satanic master.

Largely through the influence of Mr. Anthony Comstock, laws have been enacted which promise to do much toward checking this extensive evil, or at least causing it to make itself less prominent. Our newspapers still abound with advertisements of various so-called medical works, "Marriage Guides," etc., which are fruits of the same "upas-tree" that Mr. Comstock has labored so faithfully to uproot.

It is a painful fact, however, that the total annihilation of every foul book which the law can reach will not effect the cure of this evil, for our modern literature is full of the same virus. It is necessarily presented in less grossly revolting forms, half concealed by beautiful imagery, or embellished by wit; but yet, there it is, and no law can reach it. The works of our standard authors in literature abound in lubricity. Popular novels have doubtless done more to arouse a prurient curiosity in the young, and to excite and foster passion and immorality, than even

the obscene literature for the suppression of which such active measures have recently been taken. The more exquisitely painted the scenes of vice, the more dangerously enticing. Novel-reading has led thousands to lives of dissoluteness.

Many other causes might be enumerated, as idleness, evil associations, etc., but we need not dwell longer on this point.

Unthought-of Excesses.—Sexual wrong exists among the married as well as the unmarried, and that within the pale of the marriage rite. Ignorant or regardless of the consequences, many married people give loose rein to their passions, supposing that the marriage vow removes all duty of restraint. Nature does not, however, forget to inflict upon the offenders commensurate punishment for their wrong-doing. A long list of diseases, affecting both males and females, might be presented as the direct consequences of this form of sexual transgression. Married people should recollect that the duty of restraint is as binding upon them after as before marriage.

Without stopping to consider the various circumstances under which absolute continence is expedient, or desirable, or morally required, we will proceed at once to examine the question, Is continence harmful?

Continence not Injurious.—It has been claimed by many, even by physicians,—and with considerable show of reason,—that absolute continence, after full development of the organs of reproduction, could not be maintained without great detriment to health. It is needless to enumerate all the different arguments employed to support this position, since they are, with a few exceptions, too frivolous to deserve attention. We shall content ourselves chiefly with quotations from acknowledged authorities, by which we shall show that the popular notions upon this subject are wholly erroneous. Their general acceptance has been due, without doubt, to the strong natural bias in their favor. It is an easy matter to believe what agrees well with one's predilections. A bare surmise on the side of prejudice, is more telling than the most powerful logic on the other side.

"We know that this opinion is held by men of the world, and that many physicians share it. This belief appears to us to be erroneous, without foundation, and easily refuted."*

The same writer claims "that no peculiar disease nor any abridg-

* Mayer.

ment of the duration of life can be ascribed to such continence." He proves his position by appealing to statistics, and shows the fallacy of arguments in support of the contrary view. He further says:—

"It is determined, in our opinion, that the commerce of the sexes has no necessities that cannot be restrained without peril."

"A part has been assigned to *spermatic plethora* in the etiology of various mental affections. Among others, priapism has been attributed to it. In our opinion, this malady originates in a disturbance of the cerebral nerve power; but it is due much less to the retention of sperm than to its exaggerated loss; much less to virtuous abstinence than to moral depravity."

There has evidently been a wide-spread deception upon this subject. "Health does not absolutely require that there should ever be an emission of semen, from puberty to death, though the individual live a hundred years; and the frequency of involuntary nocturnal emissions is an indubitable proof that the parts, at least, are suffering under a debility and morbid irritability utterly incompatible with the general welfare of the system."

Does not Produce Impotence.—It has been declared that strict continency would result in impotency. The falsity of this argument is clearly shown by the following observations:—

"There exists no *greater error* than this, nor one more opposed to physiological truth. In the first place, I may state that I have, after many years' experience, never seen a single instance of atrophy of the generative organs from this cause. I have, it is true, met the complaint, but in what class of cases does it occur? It arises, in all instances, from the exactly opposite cause, abuse; the organs become worn out, and hence arises atrophy. Physiologically considered, it is not a fact that the power of secreting semen is annihilated in well-formed adults leading a healthy life and yet remaining continent. No continent man need be deterred by this apocryphal fear of atrophy of the testes, from living a chaste life. It is a device of the unchaste,—a lame excuse for their own incontinence, unfounded on any physiological law." *

The truth of this statement has been amply confirmed by experiments upon animals.

The complaint is made by those whose lives have been far otherwise than continent, that abstinence occasions suffering, from which indul-

* Acton.

gence gives relief. The same writer further says that when such a patient consults a medical man, "he should be told—and the result would soon prove the correctness of the advice—that attention to diet, gymnastic exercise, and self-control, will most effectually relieve the symptoms."

Difficulty of Continence.—Some there are who urge that self-denial is difficult; that the natural promptings are imperious. From this they argue that it cannot but be right to gratify so strong a passion. "The admitted fact that continence, even at the very beginning of manhood, is frequently productive of distress, is often a struggle hard to be borne,—still harder to be completely victorious in,—is not to be at all regarded as an argument that it is an *evil.*" *

But if rigid continence is maintained from the first, the struggle with the passions will not be nearly so severe as after they have once been allowed to gain the ascendency. On this point, the following remarks are very just:—

"At the outset, the sexual necessities are not so uncontrolled as is generally supposed, and they can be put down by the exercise of a little energetic will. There is, therefore, as it appears to us, as much injustice in accusing nature of disorders which are dependent upon the genital senses, badly directed, as there would be in attributing to it a sprain or a fracture accidentally produced." †

Helps to Continence.—As already indicated, and as every individual with strong passions knows, the warfare with passion is a serious one if one determines to lead a continent life. He needs the help of every aid that he can gain. Some of these may be named as follows:—

The Will.—A firm determination must be formed to lead a life of purity; to quickly quench the first suggestions of impurity; to harbor no unchaste desire; to purge the mind of carnal thoughts; in short, to cleave fast to mental continence. Each triumph over vicious thoughts will strengthen virtue; each victory won will make the next the easier. So strong a habit of continence may be formed that this alone will be a bulwark against vice.

Diet.—He who would keep in subjection his animal nature must carefully guard the portal to his stomach. The blood is made of what is eaten. Irritating food will produce irritating blood. Stimulating foods or drinks will surely produce a corresponding quality of blood.

* Acton. † Mayer.

Irritating, stimulating blood will irritate and stimulate the nervous system, and especially the delicate nerves of the reproductive system, as previously explained. Only the most simple and wholesome food should be eaten, and that only in such moderate quantities as are required to replenish the tissues. The custom of making the food pungent and stimulating with condiments is the great, almost the sole, cause of gluttony. It is one of the greatest hindrances to virtue. Indeed, it may with truth be said that the devices of modern cookery are most powerful allies of unchastity and licentiousness. This subject is particularly deserving of careful, candid, and studious attention, and only needs such investigation to demonstrate its soundness.

Exercise.—Next to diet as an aid to continence, perhaps of equal importance with it, is exercise, both physical and mental. It is a trite proverb, the truth of which every one acknowledges, that "Satan finds some mischief still for idle hands to do," and it is equally true that he always has an evil thought in readiness—speaking figuratively—to instill into an unoccupied mind. A person who desires to be pure and continent in body and mind must flee idleness as he would the devil himself; for the latter is always ready to improve upon the advantages afforded by an idle moment, an hour given to reverie.

Walking, riding, rowing, and gymnastics are among the best modes of physical exercise for sedentary persons; but there is no better form of exercise than working in the garden. The cultivation of small fruits, flowers, and other occupations of like character, really excel all other modes of physical exercise for one who can engage in them with real pleasure. Dozing is bad at any time; for it is a condition in which the will is nearly dormant, though consciousness still lingers, and the imagination is allowed to run wild, and often enough it will run where it ought not. Late study, or late hours spent in any manner, is a sure means of producing general nervous irritability and sexual excitement through reflex influence.

Bathing.—A daily bath with cool or tepid water, followed by vigorous rubbing of the skin with a coarse towel and then with the dry hand, is a most valuable aid. The hour of first rising is generally the most convenient time. General and local cleanliness are indispensable to general and local health.

Religion.—After availing himself of all other aids to continence, if he wishes to maintain purity of mind as well as physical chastity,—and one cannot exist long without the other,—the individual must seek that

most powerful and helpful of all aids, divine grace. If, in the conflict with his animal nature, man had only to contend with the degrading influences of his own propensities, the battle would be a serious one, and it is doubtful whether human nature alone—at least in any but rare cases—would be able to gain the victory; but, in addition to his own inherent tendencies to evil, man is assailed at every point by unseen agencies that seek to drag him down and spoil his soul with lust. These fiendish influences are only felt, not seen, from which some argue that they do not exist. Such casuists must find enormous depths for human depravity. But who has not felt the cruel power of these unseen foes? Against them, there is but one safe, successful weapon, "the blood of Christ which cleanseth from all sin."

The struggling soul, beset with evil thoughts, will find in prayer a salvation which all his force of will, and dieting, and exercising, will not, alone, insure him. Yet prayer alone will not avail. Faith and works must always be associated. All that one can do to work out his own salvation, he must do; then he can safely trust in God to do the rest, even though the struggle seems almost a useless one; for when the soul has been long in bondage to concupiscence, the mind a hold of foul and lustful thoughts, a panorama of unchaste imagery, these hateful phantoms will even intrude themselves upon the sanctity of prayer, and make their victim mentally unchaste upon his knees. But Christ can pity even such; and even these degraded minds may yet be pure if with the psalmist they continue to cry, with a true purpose and unwavering trust, "Create in me a clean heart, O God, and renew a right spirit within me." "Purge me with hyssop, and I shall be clean; wash me, and I shall be whiter than snow."

At the first suggestion of an evil thought, send up a mental prayer to Him whose ear is always open. Prayer and impurity are as incompatible as oil and water. The pure thoughts that sincere prayer will bring, displace the evil promptings of excited passion. But the desire for aid must be sincere. Prayer will be of no avail while the mind is half consenting to the evil thought. The evil must be loathed, spurned, detested.

It would seem almost unnecessary to suggest the impropriety of resorting to prayer alone when sexual excitability has arisen from a culpable neglect to remove the physical conditions of local excitement by the means already mentioned. Such physical causes must be well looked after, or every attempt to reform will be fruitless. God requires

of every individual to do for himself all that he is capable of doing; to employ every available means for alleviating his sufferings.

Sexual Crimes.—The sexual crimes with which we wish to deal, as being those most seldom referred to, are prevention of conception, and intentional abortion. The first-mentioned, we are aware, is hardly considered a crime by the majority of people; and the same might be said respecting the second with large numbers of persons, though it is so recognized by the law. All medical authorities agree that prevention of conception, no matter by which one of the numerous methods commonly employed it may be induced, is always harmful and productive of disease. Personal experience in the medical care of a large number of ladies suffering with all forms of sexual derangements has enabled us to confirm this judgment many times. As it cannot be told at just what moment fecundation takes place, and as it may occur immediately, some of the methods employed for prevention plainly involve moral principles most seriously. It has been previously shown that in the ovum of the female, and the spermatozoön of the male, are, in rudimentary form, all the elements which go to make up the "human form divine." Alone, neither of these elements can become anything more than it already is; but the instant that the two elements come in contact, fecundation takes place, and the individual life begins. From that moment until maturity is reached, years subsequently, the whole process is only one of development. Nothing absolutely new is added at any subsequent moment. In view of these facts, it is evident that at the very instant of conception the embryonic human being possesses all the right to life it ever can possess. It is just as much an individual, a distinct human being, possessed of soul and body, as it ever is, though in a very immature form. That conception may take place during the reproductive act cannot be denied. If, then, means are employed with a view to prevent conception immediately after the accomplishment of the act, or at any subsequent time, if successful, it would be by destroying the delicate product of the conception which had already occurred, and which, as before observed, is as truly a distinct individual as it can ever become—certainly as independent as at any time previous to birth.

Is it immoral to take human life? Is it a sin to kill a child? Is it a crime to strangle an infant at birth? Is it a murderous act to destroy a half-formed human being in its mother's womb? Who will dare to answer "No," to one of these questions? Then, who can re-

fuse assent to the plain truth that it is equally a murder to deprive of life the most recent product of the generative act?

Who can number the myriads of murders that have been perpetrated at this early period of existence? Who can estimate the load of guilt that weighs upon some human souls? and who knows how many brilliant lights have been thus early extinguished? how many promising human plantlets thus ruthlessly destroyed in the very act of germinating? It is to be hoped that in the final account the extenuating influence of ignorance may weigh heavily in the scale of justice against the damning testimony of these "unconsidered murders."

Criminal Abortion.—Few but medical men are aware of the enormous proportions which have been assumed by this terrible crime during the present century. That it is increasing with fearful rapidity and has really reached such a magnitude as to seriously affect the growth of civilized nations, and to threaten their very existence, has become a patent fact to observing physicians.

An eminent medical author asserts "that the frequency of this form of destroying human life exceeds all others by at least fifty per cent, and that not more than one in a thousand of the guilty parties receive any punishment by the hand of civil law. But there is a surer mode of punishment for the guilty mother in the self-executing laws of nature."

The destruction of the child after the mother has felt its movements is termed infanticide; before that time it is commonly known as abortion. It is a modern notion that the child possesses no soul or individual life until the period of quickening, an error which we have already sufficiently exposed. The ancients, with just as much reason, contended that no distinct life was present until after birth. Hence it was that they could practice without scruple the crime of infanticide to prevent too great increase of population.

The effects of this crime are not upon the child alone. The mother suffers not only imminent peril of life at the time, but the almost certain penalty of chronic invalidism the remainder of her life. We have good authority for the assertion that abortion is *fifteen times as dangerous* as natural childbirth. With reference to the immorality of the act the author of "The Ten Laws of Health" says:—

"There are those who would fain make light of this crime by attempting to convince themselves and others that a child, while in embryo, has only a sort of vegetative life, not yet endowed with

thought, and the ability to maintain an independent existence. If such a monstrous philosophy as this presents any justification for such an act, then the killing of a newly-born infant, or of an idiot, may be likewise justified. The destruction of the life of an unborn human being, for the reason that it is small, feeble, and innocently helpless, rather aggravates than palliates the crime. Every act of this kind, with its justification, is obviously akin to that savage philosophy which accounts it a matter of no moment, or rather a duty, to destroy feeble infants, or old, helpless fathers and mothers." *

"From a very large verbal and written correspondence in this and other States, I am satisfied that we have become *a nation of murderers.*" †

Said a distinguished clergyman of Brooklyn in a sermon, "Why send missionaries to India when child-murder is here of daily, almost hourly occurrence; aye, when the hand that puts money into the contribution-box to-day, yesterday or a month ago, or to-morrow, will murder her own unborn offspring?"

Whether this gigantic evil can ever be eradicated, is exceedingly doubtful. To effect its cure would be to make refined Christians out of brutal sensualists; to emancipate woman from the enticing, alluring slavery of fashion; to uproot false ideas of life and its duties,—in short, to revolutionize society. The crime is perpetrated in secret. Many times no one but the criminal herself is cognizant of the evil deed. Only occasionally do cases come near enough to the surface to be dimly discernible; hence the evident inefficiency of any civil legislation. But the evil is a desperate one, and is increasing; shall no attempt be made to check the tide of crime and save the sufferers from both physical and spiritual perdition? An effort should be made, at least. Let every Christian raise the note of warning. From every Christian pulpit let the truth be spoken in terms too plain for misapprehension. Let those who are known to be guilty of this most revolting crime be looked upon as murderers, as they are; and let their real moral status be distinctly shown.

It should be known, too, that wives are not the only ones to be blamed in this matter. In many instances husbands are the instigators as well as the abettors of the crime, and in their hands lies the power to stay the sacrifices to this horrible modern Moloch.

* J. R. Black, M. D. † Reamy.

Secret Vice.—We most deeply deplore the necessity for mentioning one more evil akin to those already dwelt upon; but our knowledge of the great prevalence and terrible consequences of the awful sin known as solitary or secret vice, masturbation, etc., presses upon us the obligation to let no fit opportunity pass without raising a warning voice. This pernicious habit, which is so common that we need not describe it, we are loth to say, but must in deference to truth, is by no means confined to boys; girls also indulge in it, though, it is to be hoped, to a less fearful extent than boys, at least in this country. A Russian physician, quoted in our hearing by an eminent medical professor in New York, stated that the habit is universal among girls in Russia. It seems impossible that such a statement should be true; and yet we have not seen it contradicted. It is more than probable that the practice is far more nearly universal everywhere than even medical men are willing to admit. Many young men who have been addicted to the vice, have, in their confessions, declared that they found it universal in the schools in which they learned the practice.

Parents who have no suspicion of the evil, who think their children the embodiment of purity, will find by careful observation and inquiry,—though personal testimony cannot be relied upon,—that in numerous instances their supposed virtuous children are old in corruption. Such a revelation has brought dismay into many a family, only too late in some cases. Said a wealthy and intelligent lady in whose hands our work entitled "Plain Facts for Old and Young" was placed by an agent, "Oh, if I had only seen this work ten years ago my poor boy might have been saved!" She was the mother of a large family of sons and daughters, most of whom were remarkably bright and intelligent. But one had fallen a victim to this awful vice, and was then in an insane asylum, his mind a hopeless wreck, in consequence.

The causes of this vice are numerous, including all which tend to produce sexual precocity, and those which have been enumerated as leading to unchastity. These we need not recapitulate; we would, however, mention one cause which in our opinion is, more than all others, the exciting agent in the propagation of the vice; viz.,—

Evil Associations.—The influence of evil companionship is one of the most powerful agents for evil against which those who love purity and are seeking to elevate and benefit their fellow-men have

to contend. A bad boy can do more harm in a community than can be counteracted by all the clergymen, Sabbath-school teachers, tract-distributers, and other Christian workers combined. An evil boy is a pest, compared with which the cholera, small-pox, and even the plague, are nothing. The damage which would be done by a terrific hurricane sweeping with destructive force through a thickly settled district is insignificant compared with the evil work which may be accomplished by one vicious lad.

No community is free from these vipers, these agents of the arch-fiend. Every school, no matter how select it may be, contains a greater or less number of these young moral lepers. Often they pursue their work unsuspected by the good and pure, who do not dream of the vileness pent up in the young brains which have not yet learned the multiplication table, and scarcely learned to read. We have known instances in which a boy of seven or eight years of age has implanted the venom of vice in the hearts and minds of half a score of pure-minded lads within a few days of his first association with them. This vice spreads like wild-fire. It is more "catching" than the most contagious disease, and more tenacious, when once implanted, than the leprosy.

Boys are easily influenced either for right or for wrong, but especially for the wrong; hence it is the duty of parents to select good companions for their children, and it is the duty of children to avoid bad company as they would avoid carrion or the most loathsome object. A boy with a match-box in a powder-magazine would be in no greater danger than in the company of most of the lads who attend our public schools and play upon the streets. It is astonishing how early children, especially boys, will sometimes learn the hideous, shameless tricks of vice which yearly lead thousands down to everlasting death. Often children begin their course of sin while yet cradled in their mother's arms, thus early taught by some vile nurse.

It were better for a boy never to see or associate with a lad of his own age than to run any risk of being corrupted before he is old enough to appreciate the terrible enormity of sin and the awful consequences of transgression. It should be recollected also that not only young boys but vicious youths and young men are frequently the instructors in vice. It is unsafe to trust any but those who are known to be pure. But the difficulties of knowing who is to be trusted are so great that the only real safety is in beginning at a very early age

to fortify the minds of the little ones against the danger by admonitions and instruction suited to their age and understanding.

The Evil Underestimated.—While there have been those who have exaggerated the consequences of secret vice for nefarious purposes there is another class of physicians who take the opposite extreme, declaring that its effects are slight, and often not felt at all. We are at something of a loss to decide which class has done the most harm, the quacks who have basely excited fears beyond what the facts would warrant, for their own selfish advantage, or the medical gentlemen—most of them quite eminent in the profession—who, by declaring the vice to be harmless, have encouraged its propagation. We have no part with either class. The consequences which we have seen in our own experience, having had scores of the victims under our professional care, are sufficiently terrible to warrant us in raising a warning cry which we would gladly make loud enough to reach the ears of every child and youth in America. The vice is an exterminating one. It ruins more lives than all other sexual vices together, because the most prevalent.

We have not space here to dwell at length upon its symptoms and treatment, and need not do so, as we have discussed the subject at length elsewhere.*

*In the following works the author has treated at length the subject briefly dealt with in the foregoing pages: "Plain Facts," "Man, the Masterpiece," and "Ladies' Guide." Modern Medicine Publishing Co., Battle Creek, Mich.

FOOD AND DIET.

We need not dwell upon the importance of this department of hygiene, as there can be no doubt that this subject is one of the most important of all which relate to the physical welfare of human beings. Since the human body is made of what is received into it in the form of food, it is evident that the character of a person's food will determine his own character. Experiments have again and again proved this to be true of animals, and it can be no less true of human beings. A few facts bearing on this point may not be without interest to the general reader.

It has been found that the bones of hogs fed on food which had been colored with madder, a peculiar coloring matter, were stained the same color.

When herbivorous animals are fed on animal food, their flesh acquires an unpleasant and unpalatable flavor.

M. Monclar, a French agriculturist, has been experimenting upon this subject, and finds that he can flavor the flesh of animals at pleasure by feeding them upon various kinds of food and employing a variety of strong flavoring substances. He was led to investigate the subject by the observation that hares killed in a wormwood field, and eggs laid by hens which had eaten diseased silk-worms, had such a nauseous taste that no one could eat them. These facts accord well with an account which we published some years ago of the poisoning of a family by eating chickens which had fed upon potato bugs. A few years ago, also, a case was reported in which a family in Ohio were poisoned, some persons fatally, by eating chickens which had feasted upon the carcass of a cow that died of milk sickness.

Dr. Parkes, the eminent English writer on hygiene, mentions the fact that a regiment of soldiers under his care were attacked by diarrhea in consequence of eating pork which had been fed on garbage.

Plenty of instances might be cited to show that thousands of infants have lost their lives in consequence of eating the milk of cows fed on swill or distillery slops.

Numerous other evidences might be given on this point, but these are sufficient.

Definition of Food.—The numerous definitions of food which have been framed at different times and by different persons, too often, we have reason to fear, have been made to fit some pet hobby or preconceived notion. We offer the following as being the most nearly in accordance with what is known of the relation of various substances called foods to the human system: *Foods are those substances which when introduced into the system are capable of supplying the loss occasioned by the natural wastes of the body.* When considered in its broadest sense, the term food includes all liquids and gases as well as solids capable of supplying the needs of the body resulting from the wear and tear of the system. We shall consider under this head, however, only solids and liquids, or what are usually termed food and drink.

Classification of Foods.—For our purpose, food may be simply classified as follows:—

1. Albuminous, or nitrogenous.
2. Farinaceous and saccharine.
3. Oleaginous, or fatty.
4. Inorganic.

Albuminous Elements.—An example of nearly pure albumen is found in the white of egg. This may be considered as a type of the whole class of albuminous or nitrogenous food elements, a great variety of which are found in both the animal and the vegetable kingdom. In wheat, this class is represented by gluten; in oatmeal, by vegetable albumen; in peas, beans, and other leguminous seeds, by vegetable caseine. In animal foods we have the albumen of eggs, albumen and fibrine of the blood, and more or less in most animal tissues; the caseine of milk; etc. All elements of this class sustain essentially the same relation to the system and to the organs of digestion, so that no discrimination need be made between them here. As a class, when digested and formed into blood, they serve to nourish the living or most highly vitalized tissues of the body, as the muscles, brain, nerves, glands, and other active organs. Associated with the albuminous elements are the various salts which nourish the bones and also enter into the composition of a few of the other tissues.

The experiments of Dr. Austin Flint upon the pedestrian Weston, as well as the experiments of Prof. Liebig, Subbotin, and many other

distinguished physiologists, show very clearly that the nitrogenous elements are the chief supporters of vital activity, muscular and nervous effort, etc., and that food can only support vital action or give rise to force by being assimilated into living tissue.

Starch and Sugar.—The farinaceous and saccharine class includes all varieties of starch and sugar. All vegetables and grains, and most fruits, contain starch. In some cases, as in most grains and in such vegetables as potatoes, turnips, and most other fleshy roots and tubers, starch is the most abundant element, often constituting as large a proportion as two-thirds or three-fourths of the whole bulk or weight of the article of food. Each particular vegetable, grain, or fruit has its own peculiar variety of starch; but the difference is chiefly in the form and size of the separate particles or granules. The only exception to this statement is that the starch of vegetables is, in general, less easy of digestion than that of grains.

Fig. 140. Starch Granules.

In its raw state, each little particle or granule of starch (Fig. 140) is inclosed in an envelope, which protects it from the action of water, rendering it insoluble. By the process of cooking, and in fruits by the ripening process, this envelope is dissolved or ruptured, and the homogeneous contents of the granules are thus rendered soluble,—a change which is necessary before digestion can take place.

There are several varieties of sugar, which differ among themselves much more than do the several varieties of starch. The most common variety is cane-sugar, which is chiefly manufactured from the different varieties of sugar-cane, although it is also made from the juice of the sugar beet and from the sap of the maple-tree. It is found, also, in considerable quantities, in the date and in a few other fruits. Cane-sugar is the sweetest of all the sugars.

Grape-sugar, or *glucose,* is the name of the variety of sugar which is most abundant in nature, being found in grapes and many other fruits. Lævulose, the sugar of fruit, is very abundant in nature. It is the sweetest of all the sugars. In honey, lævulose and glucose are pres-

ent in about equal proportions. The sugar resulting from starch digestion, formerly supposed to be glucose, is now known to be maltose, which is also produced by the action of malt upon starch. The saccharine ingredient of milk is known as milk-sugar, or *lactose*. It is much less sweet than the other varieties of sugar, but possesses the same general properties.

The close relation between starch and sugar is seen by the fact that in the plant one element is derived from the other. The starch of grains, of the potato, of nearly all seeds, in fact, is in the process of germination converted into sugar, when it becomes nourishment for the growing plant. The rapid growth of new leaves formed by the maple and other trees in the spring is through the production of sugar from the starch stored up in the roots of the tree in the fall. In the spring, the vital processes of the plant convert this insoluble starch into soluble sugar, and by its ascent with the sap, the astonishingly rapid growth often noted in the spring is effected. By tapping the tree at this period, as is done in the case of the maple, a portion of the sap may be abstracted, and by its condensation, maple sugar is made.

It is possible for the chemist to imitate nature in a limited degree in this sugar-making process, since, as is well known, starch may be converted into glucose, or grape-sugar, by purely chemical processes. It is even possible for the chemist to produce sugar out of woody fibre, as from paper, straw, cotton cloth, or sawdust, the structures which are formed in the plant by the assimilation of starch or sugar. Being originally formed from sugar, the chemist is able to bring it back to its original condition again, though not in a state in which it can be utilized as food by the human system. This close relation of starch and sugar places them in the same class, although they are treated somewhat differently by the organs of digestion, and can by no means be taken interchangeably as food for reasons which will appear when we have considered at length the mode of digestion of these two alimentary elements.

The principal nutritive value of this class of foods, like that of the class of fatty elements, is to maintain the supply of energy and heat. Just how the changes necessary to the evolution of heat are effected, is not fully understood; but it is well established that they do occur.

Fats.—Little need be said on this subject, as every one is familiar with the various fats which usually enter into the composition of food. Butter, lard, and suet are the principal animal fats. Most of the

grains, some vegetables, a few fruits, and especially nuts, contain various vegetable oils; but the elements of the different varieties of animal and vegetable fats are essentially the same, the three fatty elements, oleine, margarine, and stearine, differing chiefly in consistency at ordinary temperatures. The differences in the various fats and oils are principally due to the different proportions in which these various elements are combined.

Fats are insoluble in water, but dissolve readily in alcohol, and in oils. In mucilaginous and alkaline fluids they are divided into very minute particles, forming what is termed an emulsion, in which form they exist in milk, which is an alkaline fluid. Being lighter than the

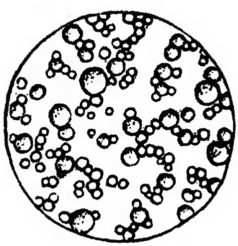


Fig. 141. Milk Globules.

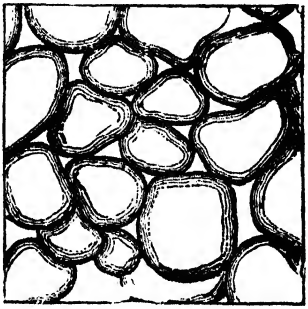


Fig. 142. Fat Cells.

other constituents of milk, they naturally rise to the surface, forming the cream. By the process of churning, the separate particles are made to unite, thus producing butter. In Fig. 141 may be seen the appearance of healthy milk when viewed by a microscope of good magnifying powers.

In animal tissues, fats are found in the form of cells, as shown in Fig. 142. Each cell has a wall of connective tissue which retains its contents until digested by the gastric juice. In vegetable productions the fatty elements are closely associated with the albuminous and inorganic, a fact which furnishes an additional argument in favor of the use of oatmeal, and the unbolted meal of other grains.

Like the farinaceous and saccharine elements of food, the fatty elements are chiefly useful for the support of animal heat, although they are also a source of energy and of adipose tissue.

It should be remarked in this connection that saccharine and farinaceous substances are included in what is called the carbonaceous class of food elements, this class being so named because the sub-

stances included in it contain a large proportion of carbon and no nitrogen, by which they are distinguished from albuminous elements.

Inorganic Elements.—In addition to the three classes of elements named above, the chemist finds, upon making a chemical analysis of foods, certain salts, the chief of which are phosphates and carbonates of potash, soda, and lime, and chlorides of potash and soda. These elements cannot be extracted from foods by a simple mechanical process, as can starch, sugar, gluten, and the other elements named, but are only found upon destruction of the food substance. The most careful microscopical examination of the various food substances does not reveal the presence of any of these elements in an inorganic state. There is good reason for believing that they are in an organic or partly organized state as they exist in food substances. Similar investigations show that the so-called inorganic elements exist in this state in the animal tissues, even in the bones, which contain the largest proportion of this kind of matter of any of the tissues.

The principle was established long ago that animals cannot organize or vitalize matter, but simply possess the power to appropriate nourishment in the form of a substance which has been already vitalized by the vegetable kingdom.

In addition to the elements already mentioned under this head, all vegetable foods contain a certain proportion of innutritious matter which constitutes the framework of the tissue, being of a woody character. Vegetable cells of all sorts contain more or less of this woody material, or cellulose, in their composition. Most animal foods also contain more or less indigestible elements.

Although wholly indigestible in character, and so not directly nutritious, these elements of food are really very useful: first, in giving the required bulk to the food; and, second, in producing the mechanical irritation necessary to excite proper secretion and muscular action to carry on the digestive process. Thus they become a very important accessory to digestion and nutrition. It is partly on this account that oatmeal, wheat meal, or graham flour, and other whole-grain products, are so much to be preferred above the superfine flour which millers take pride in producing of the utmost possible fineness and whiteness.

Superfine flour is distinctly a modern invention. The ancients used unbolted meal altogether, the present disease-producing devices known as bolting machines being then not in use. Indeed, many nations at the

present day, as the Germans, Scandinavians, and, in fact, most nations, with the exception of the French, English, and American nations, still adhere, substantially, to the ancient custom in this regard. No doubt the hardihood of the native German peasant is in great part justly attributable to the highly nourishing qualities of his "black bread."

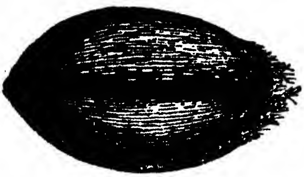


Fig. 143. Grain of Wheat magnified.

The "New Process" flour now manufactured is much superior to that of superfine character, as it contains a much larger proportion of the elements especially calculated to nourish the brain and nerves and to support the vigor and vitality of the body.

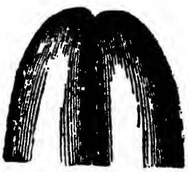


Fig. 144. Grain of Wheat with Husk removed.

It may be interesting in this connection to give a little attention to the structure of a kernel of grain, by studying the accompanying cuts, taking the wheat as a type of all the grains.

Fig. 143 shows a grain of wheat greatly magnified, the rough, hairy character of the surface being made very apparent.

In Fig. 144 is seen half of a grain which has been subjected to a process for removing the rough external covering of the grain.

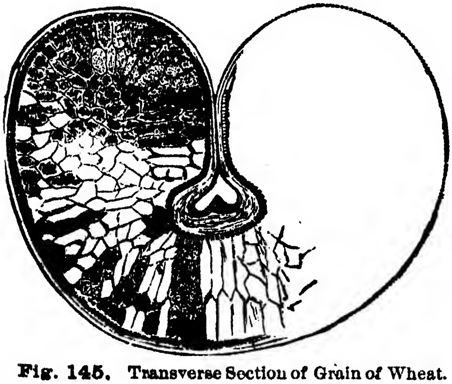


Fig. 145. Transverse Section of Grain of Wheat.

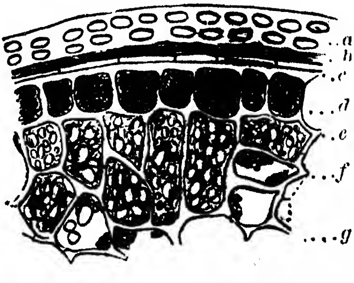


Fig. 146. Same as Fig. 145, more highly magnified.

Fig. 145 is a magnified section of the central portion of a grain, showing its internal cellular structure.

Fig. 146 represents a small portion of a similar section more highly magnified, showing the various layers of the grain with great distinct-

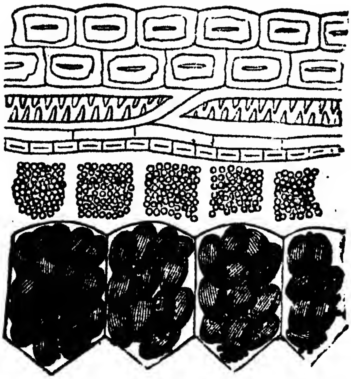


Fig. 147. Same as Fig. 145. Very highly magnified.

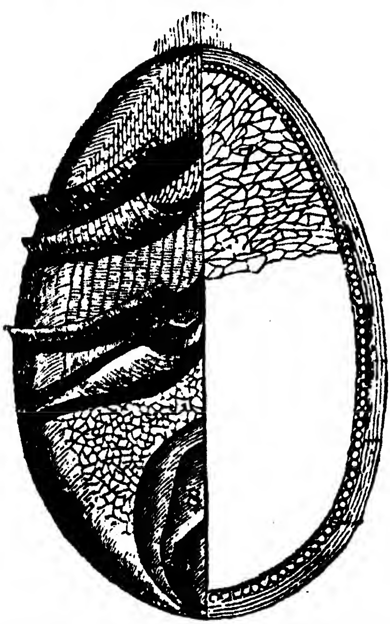


Fig. 148. This cut shows the General Structure of the Grain of Wheat.

ness. *a.* Represents the outer, woody layer, or bran; *b.* The layer just beneath, which contains more or less woody matter and is very rich in nitrogenous matter, the "salts," and, in some grains, with fatty matters; *c.* and *d.* Other cellular layers covering the central portion of the grain, rich in albuminous elements; *e. f. g.* The central or starchy portion of the grain, which is the chief constituent of superfine flour.

Fig. 147 shows all of these layers much more greatly magnified.

Fig. 148. This cut shows the several layers of cells which compose the grain of wheat. All but the outermost of these contain in abundance the most important of all the vegetable food products. We are indebted for the use of these cuts to the courtesy of the Franklin Mills Co., of Lockport, N. Y., by whom they were made, to illustrate the advantages of their flour made from the entire wheat by a process which retains all its nutritive properties in a form the most easy of digestion.

Food Elements not Food.—By means of numerous experiments at the expense of numberless dogs, rabbits, pigeons, cats, and other animals, it has been clearly demonstrated that while the various elements mentioned are food elements, they are not in themselves food, either when taken alone or when artificially mixed. Dogs fed on albumen, fibrine, or gelatine,—the constituents of muscle,—died in about

a month. The same result followed when they were fed on the constituents of muscle artificially mixed. A goose fed on the white of egg died in twenty-six days. A duck fed on butter starved to death in three weeks, with the butter exuding from every part of its body, its feathers being saturated with fat. Dogs fed on oil, gum, and sugar, died in four to five weeks. A goose fed on gum died in sixteen days; one fed on sugar, in twenty-one days; two that had only starch lived twenty-four and twenty-seven days. Dogs fed on fine-flour bread lived but fifty days.

Food Substances.— The various substances used for food are classified, first, as animal and vegetable.

Vegetable food is rather imperfectly classified into fruits, grains, and vegetables. This division is quite faulty, as not one of the classes properly includes nuts or such seeds as peas and beans. Vegetables include all other parts of plants used as food, with the exception of the seed portions. Pumpkins, squashes, cucumbers, melons, and similar foods usually called vegetables, are really fruits.

Health Foods.—The great number of persons requiring specially prepared foods adapted to a weakened state of their digestive organs and special forms of digestive disability, has given rise to the manufacture of many so-called "health foods." The most valuable of these are made by the Sanitarium Health Food Co., of Battle Creek, Mich. The following are a few of the most useful of these foods: —

Granola is a food prepared from different grains and by the process of manufacture partially digested, the starch being converted into dextrine and soluble starch.

Granose is a food consisting of the whole-wheat berry, subjected to a process of thorough cooking and disintegration and partial digestion, whereby it is rendered very easy of digestion and assimilation. It is especially good as a food remedy for constipation, acidity of the stomach, and hyperpepsia, and is exceedingly palatable.

Gluten is a specially valuable food in hypopepsia and diabetes.

Kumyzoon is a preparation of milk in which the lactates of sugar and milk are converted into lactic acid. It is specially good in cases of jaundice, obesity, and a large class of dyspeptics.

Malted Gluten is an invaluable food remedy for conditions requiring concentrated and easily assimilated food, and in which the patient is unable to take milk.

Lac Vegetal, or Vegetable Milk, is a preparation made from fruit and nuts, closely resembling natural milk both in appearance and composition.

The following quotations from the Sacred Books of the Hindoos will also be found of interest in relation to this subject, especially as they have swayed the opinions and governed the practices of millions of people for many centuries, including nearly 200,000,000 Hindoos living at the present day :—

"Those are skillful cooks who do not use their utensils for meat."—*The Rig Veda, Mandal 1, Sukta 162, Mantra 13.*

"He who consents to the death of an animal, he who kills it, he who dissects it, he who buys it, he who sells it, he who dresses it, he who serves it up, and he who eats it, are (eight kinds of) butchers."— *Code of Manŭ*, V. 51. (*Sir William Jones.*)

"Thou shalt not kill the cow. Thou shalt not kill the sheep or goat. Thou shalt not kill the bipeds (birds and men)."—*The Yajur Veda, Adhyaya XIII, Mantras 43, 44, 47.*

General Bhishma, the Commander-in-Chief of the Kooroos, said to Emperor Yudhishthhir: "Unslaughter is the supreme virtue, supreme asceticism, golden truth, from which springs up the germ of religion."—*The Mahabharata, Anushasana Parva, Adhyaya 115, Shloka 25.*

"The prosperity of the universal human race depends upon the existence and prosperity of the lower animals."

"Surely hell, fire, and repentance are in store for those who for their pleasures and gratifications cause the dumb creatures to suffer pain."—*The Zend Avesta.*

Natural Food Flavors.—All natural foods contain flavors which recommend them to the palate. Hot, burning, or astringent flavors are found in substances which are unwholesome and poisonous in character, and are intended by nature as sign-boards to warn human beings and animals against eating them. Natural food flavors aid nutrition by stimulating the secretion of the digestive fluids by the salivary, gastric, and other glands. Hence the food should be palatable as well as nutritious. Food without taste would soon cease to nourish the body. The highest art in cookery is the development of the natural flavors of food while at the same time increasing its digestibility.

The accompanying table shows the proportion of solid matter, chiefly nutriment, contained in one hundred parts of some of the more common substances employed as food ; the table is arranged from König's, Letheby's, and Smith's works on food, and gives the results of the most recent examinations of the several articles named.

In the foregoing table only the nutritive elements are given. In a few instances the proportions given will not aggregate one hundred parts, as the innutritious elements are left out.

Proper Proportion of the Various Elements.—It will be observed by reference to the table of nutritive values that the proportion of the various elements varies considerably. Experiments upon both animals and human beings show that it is of great importance that the proportion of elements should be such as will best meet the demands of the system, especially in the case of the albuminous and carbonaceous elements (gluten, albumen, fats, starch, and sugar). Many and extended experiments and observations have shown that the proper proportion is about one part of nitrogenous or albuminous elements to seven parts of carbonaceous elements. From this it will at once appear that most articles of food are deficient in one or the other of these classes of elements, requiring that they be supplemented by other substances eaten with them. The following table shows the proportion of carbonaceous elements to one of the albuminous in some of the more common articles of food, by the use of which any one will be able to combine various articles of food in such a manner as to secure just the right proportion of nutritive elements:—

PROPORTION OF NITROGENOUS TO CARBONACEOUS ELEMENTS IN VARIOUS FOODS.

	ALBUM. OR NITROG.	CARBONACEOUS.		ALBUM. OR NITROG.	CARBONACEOUS.
Lean Beef,	1	.5	Wheat Meal or Bread,	1	7.0
Eggs,	1	1.9	Indian Meal,	1	7.7
Peas,	1	2.7	Rye Meal,	1	9.8
Beans,	1	2.7	Potatoes,	1	10.7
Lentils,	1	2.4	Carrots,	1	11.5
Milk,	1	3.6	Barley Meal,	1	12.7
Fat Beef,	1	5.0	Rice,	1	13.0
Oatmeal,	1	6.1			

By the above table it will be seen that wheat meal is the food which, of all single substances, most perfectly meets the requirements of the system, containing exactly seven parts of the carbonaceous elements to one of the albuminous.

Beef and eggs are deficient in the carbonaceous elements. Potatoes and most other vegetables, and rice, are deficient in albuminous elements. Oatmeal has an excess of the albuminous elements. By com-

bining food substances which are deficient in one class of elements with those in which the same class is in superabundant proportion, the two classes of elements may be furnished to the system in just the right proportion. For instance, lean beef, eggs, peas, beans, milk, or oatmeal, may be used with potatoes, rice, or other foods deficient in albuminous elements. It is for this reason that the Irish or Scotch laborer by instinct combines with his potatoes oatmeal porridge or buttermilk.

For the convenience of the reader who may not wish to take the trouble to figure out the proper proportions of different foods necessary to furnish just the right amount of the albuminous elements, we have constructed the following table of combinations, which is sufficiently accurate for practical purposes (we have purposely omitted small fractions), and will be perfectly safe to follow, as we have taken care to have the albuminous, the most important element, in slight excess:—

TABLE OF COMBINED FOODS.

		OZ.				LB.	OZ.	
COMBINE		8	Lean Beef,	......	WITH	4	8	Potatoes.
"		7½	"	......	"	1	8	Rice.
"		1½	"	......	"	1	8	Indian Meal.
"		12	Eggs,	......	"	1	6	Rice.
"		9	"	......	"	5	2	Potatoes.
"		3	pts. Milk,	......	"	1		Rice.
"		2½	" "	......	"	4	4	Potatoes.
"		7½	oz. Peas,	......	"	1	4	Rice.
"		6	" "	......	"	5		Potatoes.
"	1 lb.	5	" Oatmeal,	......	"		5	Rice.
"	1 "	4	" "	......	"	1	11	Potatoes.
"	1 "	4	" "	......	"		5	Rye Meal.
"		15	" "	......	"		10	Indian Meal.

The quantity of each kind of food given in the above table, when added to that of the food substance given on the same line in the opposite column, makes just the quantity necessary to sustain life well for one day. Persons engaged in very active labor of course need more food than others, and the amounts may be increased accordingly, the same proportion being always preserved.

It may be observed that it is not necessary to combine flesh with vegetable food in order to secure the proper proportion of the nitrogenous and carbonaceous elements, since there are several vegetable foods which contain the albuminous elements in excess, which is also the case

with eggs and milk. For example, three pints of milk and one pound of rice make as perfect a combination, so far as the proportion of elements is concerned, as seven and a half ounces of lean beef and a pound and a half of rice. Seven and one-half ounces of peas and a pound and a quarter of rice is an equally perfect combination of food elements, which may also be said of one pound five ounces of oatmeal and five ounces of rice; one and a quarter pounds of oatmeal and one pound and eleven ounces of potatoes; the same quantity of oatmeal and five ounces of rye meal; or fifteen ounces of oatmeal and ten ounces of Indian meal.

Bread is not included in the list of combinations, because it is a perfect food by itself, and hence does not need to be combined with other foods, except for variety. This remark applies, of course, only to wheatmeal or graham bread. White or fine-flour bread is very deficient in albuminous elements.

Another advantage in combining various foods is to be found in avoiding too great bulk in the case of vegetable foods, and too great concentration in the case of some animal foods. This will be readily apparent when it is observed how great quantities of some single food substances are necessary to supply the system with the proper quantity of nitrogenous elements, when eaten alone, as shown by the following table:—

AMOUNT OF VARIOUS FOODS NECESSARY TO FURNISH THE PROPER DAILY AMOUNT OF NITROGENOUS ELEMENTS.

	OUNCES.		
Lean Meat	15.6	Grapes	$24\frac{1}{8}$
Eggs	21.2	Apples	$99\frac{1}{2}$
Peas	11.2	Peaches	50.0
Oatmeal	23.6	Plums	$99\frac{1}{2}$
Baker's Bread	36.7	Cherries	22.0
Wheat Flour (fine)	27.5	Carrots	15.0
Graham Flour	25.5	Turnips	16.0
Indian Meal	26.8	Cabbage	22.0
Rye Meal	37.1	Parsnips	18.0
	POUNDS.		PINTS.
Rice	3.0	Milk	4.5
Potatoes	8.8	Beer	185.0

By reference to the preceding tables any one will be able to so combine various articles of food as to secure the proper amount of nitrogenous matter without overloading the digestive organs, and yet give

to the food the bulk necessary for good digestion. Evidently, it would overtax the stomach to digest turnips in sufficient quantities to supply the wants of the body, while lean meat would afford an insufficient amount of bulk, as well as being deficient in carbonaceous matter.

Popular Errors Relating to Diet.—Probably there is no subject of importance relating to individual hygiene concerning which there are more erroneous notions entertained than respecting the matter of diet. How these errors have arisen, it is not in all cases possible to discover; but in many cases it is too evident that the medical profession are responsible in a very great degree. Many times physicians do not take sufficient care to post themselves on the subject of diet so as to be able to advise their patients wisely. The subject receives far too little attention in our colleges; and what little instruction is given in school physiologies and popular magazines is so mixed with error as to be practically useless. We will call attention to a few of these popular errors in as concise a manner as possible.

1. *It is an error to suppose that the appetite is always a correct criterion of the quality and quantity of food.*

This is a widely prevalent error, and some very distinguished physicians have given it countenance and indorsement by saying to patients, when asked for a diet prescription, "Eat whatever and whenever you have a mind to." No advice could be more mischievous. It virtually assumes either that there is no relation between diet and health, that it makes no difference what a person eats, or that the appetite is an infallible guide, both of which suppositions are palpably false. If all appetites were natural appetites, if there were no such thing as depraved taste, then might the appetite be relied upon; but in the present state of things among civilized human beings scarcely one person in a hundred has a perfectly normal taste and appetite, if the number be not even smaller. The appetite is to some degree a guide, but it must be controlled and governed by common sense, by a knowledge of the laws of digestion and the relation of alimentary substances to the stomach and the system.

Either extreme on this point is bad. The appetite must not be ignored, and it must not be blindly followed unless it is known to be normal in its inclinations. It would be just as proper to advise a person to speak anything that comes into his mind, to do everything for which he has an inclination, and to thus follow implicitly all the promptings of his various organs, as to tell him to eat everything which he feels disposed to.

2. *It is an error to suppose that sick persons whose appetites are poor should be tempted to eat by means of tidbits and dainties.*

Nothing is more common than for sick persons to be besieged with such unwholesome substances as preserves, rich jellies and sauces, pies, cakes, confectionery, etc. About as soon as a person is taken sick, in some communities, the neighbors begin to show their sympathy by contributions of all sorts of unwholesome and indigestible viands; and the invalid, whose stomach may be unable to digest any but the very simplest food, becomes a victim to the kindness of friends. Many times have the best efforts of the intelligent physician been baffled in this manner. "Killed by kindness" of this sort might be written on many a tombstone. The general belief that these things are essential for the sick when confessedly bad for the well is forcibly illustrated by the story concerning the old gentleman who arrived home late at night and not finding any pie in the cupboard awoke his wife with the exclamation, "Why, what would you do if some one should be sick in the night!" Every physician ought to look carefully after this matter whenever he has a patient in charge, and the absurdity of the custom should be thoroughly exposed. The want of appetite in sick people, especially fever patients, is usually an indication that the stomach is not in a condition to digest food, if it is received, and only the most digestible should be given, and that in small quantities.

3. *It is an error to suppose that children especially need large quantities of fat and sugar.*

The opinion has been gaining ground, of late, that fat and sugar are preventives of consumption when fed to children so as to increase their fat. From some considerable observation on the subject we are decidedly of the opinion that the practice is a bad one and the theory upon which it is based wholly erroneous. These substances are themselves difficult of digestion (this is especially true of fat), and hinder the digestion of food, thus producing dyspepsia, which causes decay of the teeth and doubtless an equally marked deterioration in other parts of the system. The notion that the appetite for sugar is a natural one is shown to be false by the fact stated by Dr. Anthony Carlisle, the Arctic traveler. According to Mr. Carlisle, the little folks in the vicinity of the North Pole are not fond of sweets. He says that when sugar was placed in their mouths they made wry faces and sputtered it out with disgust. There is no evidence whatever that it "preserves the teeth," "aids digestion," "promotes growth," or "prevents consumption," as many persons believe.

4. *It is an error to suppose that many varieties of food are essential to good digestion or nutrition.*

The common sense of most people who suffer with weak digestion has taught them that one or two kinds of food at a meal are much more easily digested than a larger variety, notwithstanding the erroneous teaching of some popular authors on this subject. It is true that the appetite sometimes refuses food when its use is long continued without change; but the variety should be obtained by employing different foods or dishes at different meals rather than at the same meal. There is no doubt that dyspepsia is not infrequently the result of the indiscriminate gormandizing in which people indulge whose chief aim in eating is to gratify the palate.

5. *It is a very great error to suppose that brain-workers, students, clergymen, lawyers, and other persons whose vocation is largely sedentary, require but little food.*

The very opposite is true. A brain-worker uses up as much blood in three hours of intense labor as the muscle-worker in ten hours of ordinary toil. Brain-workers should be well fed, but they must not be overfed. Many of the cases of apoplexy in professional men, set down to overwork, are really attributable to overeating. A brain-worker needs as much food and as nutritious food as a muscle-worker, but he is compelled to be more careful in its selection, and cannot exceed with impunity the limits of his actual needs. This point is often neglected with reference to school-children, especially girls, who are not infrequently allowed to make the attempt to live and study hard on a slice or two of white bread and a cup of coffee for breakfast, bread and butter and pickles for dinner, and a morsel chiefly made up of "dessert" at night, when dinner is taken at six, as in many of the large cities. In many female boarding-schools the dietary is neglected, an insufficient amount of nourishing elements being furnished to support the vigorous mental effort required of students. Under such a regimen it is no wonder that many young women break down just when they ought to be enjoying the highest degree of health and strength. We are thoroughly convinced that a much larger share of the breakdowns among students, male as well as female, is due to poor feeding than to overstudy.

6. *It is an error to suppose that fish or any other single article of diet is brain food, muscle food, or food for any particular part of the system.*

A few years ago a celebrated scientist made the casual suggestion

that perhaps fish food might be especially nourishing to the brain, as there was considerable phosphorus in the brain and also in the fish. The notion spread like a heresy, and soon fish of all sorts, big and little, scaly fish, shell-fish, and fish with neither scales nor shells, were devoured in unprecedented quantities by microcephalous people, and people whose brains were not obviously too small, for the purpose of obtaining the supposed specific effects of a fish diet. A gentleman, eager to cultivate his brain and induce an increased growth, addressed a letter to a noted wag, asking for advice respecting the quantity of fish which he must eat per day. The answer he received was a fitting criticism on the theory, and undoubtedly discouraged the aspirations of the young man, being to the effect that a small whale would probably be about the right quantity for a meal.

The falsity of the theory has been repeatedly shown by the citation of the fact that the lowest of all human races are those that live almost exclusively upon fish. In civilized countries, also, as in the vicinity of large fisheries, whole communities often make fish their almost exclusive diet; and yet there is no evidence that their mental capacity is increased thereby. In fact, the low mental and moral status of these people would furnish an argument on the opposite side of the question, if it were necessary to offer such argument.

7. *It is an error to suppose that people suffering with nervous debility, neurasthenia, or other forms of nervous weakness, need large quantities of flesh food.*

It is a very common custom, when it is decided that a person has any form of nervous disorder accompanied by weakness or impaired nutrition of the nervous system, to place him at once on a diet consisting largely of flesh, as beefsteak, mutton-chop, etc. Sometimes the drinking of blood is recommended. That this indiscriminate practice is a bad one we have often had occasion to notice. It not infrequently happens that the excessive use of flesh food is a cause of nervousness, as has been repeatedly pointed out, and we believe that whether its use is advised or not, should depend on the condition of the stomach rather than on the nerves. A person whose stomach is very feeble may be unable to digest sufficient vegetable food to replenish his blood and fully nourish the tissues; for such persons a flesh diet or a mixed diet will be found to be very advantageous.

8. *It is a most erroneous notion that "rich food" is strengthening*

The strengthening quality of food depends first upon its digestibility,

and second upon the proportion of albuminous elements which it contains. Sugar, fat, spices, and the other ingredients which are added to food in making it "rich," are of only secondary importance as nutritive elements, and in the case of condiments, of exceedingly doubtful value, if not wholly worthless. In the manner in which these substances are combined in "rich food," they are worse than worthless. Really rich food is that which contains a large proportion of the essential elements of food in a condition in which they may be easily assimilated. Graham bread, oatmeal mush, pea soup, baked beans, and kindred foods, are really rich, and in the highest degree strengthening.

9. *It is an error to suppose that persons engaged in laborious occupations require a large amount of flesh food.*

Persons who labor hard, either physically or mentally, need a liberal supply of food rich in albuminous elements. These elements are furnished by such food as peas and beans in even larger quantities than in the best beefsteak. A pound of peas contains four ounces of albuminous elements, while a pound of beefsteak contains but about three ounces. Oatmeal and wheat meal are also very rich in albuminous elements. The Scotch laborers who subsist very largely upon oatmeal porridge are said to be among the finest developed and hardiest men in the world. Numerous similar evidences in favor of a liberal supply of vegetable food might be given.

10. *It is an error to suppose that the system is better supported by meals at very frequent intervals than by food taken in accordance with the known time required for digestion.*

It has long been the custom to supply laborers undergoing severe exertion, as during harvest time among farmers, with two or three extra meals during the day, thus often bringing meals within two or three hours of each other. We believe that the practice is a bad one, and that three meals at most are much better than more. The custom of eating five meals a day, common in some foreign countries, is certainly most unphysiological, and must be injurious. Children are often injured by too frequent feeding; not only while infants, but after having grown up so as to be large enough to attend school, being very often supplied, by fond mothers, with luncheon for recess, and apples to eat at all hours. It is a most unwise thing to allow children to form the habit of nibbling at food between meals. The fact that they are growing, and need a large supply of nourishment, is no apology for the practice, but rather makes it the more necessary that they should be regular in their habits

in order to secure good digestion. The stomach needs rest as well as the arms and limbs and other organs of the body. More food will be well digested with three meals than with a larger number, and hence a larger amount of good blood will be produced, and more healthy tissue formed.

11. *It is an error to suppose that the best preparation and support for extraordinary exertion is to increase proportionately the amount of food eaten.*

It is generally supposed that if a man has an unusually large day's work to perform, he must eat an unusually large breakfast and a proportionately large dinner. This is certainly an error. Large demands upon either the muscular or the nervous system for the time being detract from the power to digest. The stomach requires nervous energy to enable it to perform its function. If the nervous forces are otherwise engaged or used, they cannot be utilized in digestion. Hence it follows, theoretically, at least, that instead of giving the digestive organs an extra task in preparation for an extra effort, they should be required to perform less than the ordinary amount of labor. Experience as well as theory supports this view. Sir Isaac Newton, when employed in his most arduous labors, lived upon bread and water, and fasted for long intervals. General Elliot, the famous defender of Gibraltar, is said to have subsisted for a number of days on a little boiled rice. The wonderful "L'homme Serpente" of Paris, always fasted for twelve hours before attempting to perform his marvelous feats of agility. This plan not only secures a higher degree of efficiency in the effort made, but prevents, in great degree, the injury liable to result from excessive exertion. When required to overwork for a succession of days, we have found that we were not only able to perform much more work, but to do it with less effort at the time, and less exhaustion afterward, when taking a greatly reduced quantity of food than when attempting to do the same work and still taking the usual quantity of food. We have no doubt that a neglect of this precaution is a not infrequent cause of many of the sudden deaths of which we so often receive accounts, especially among politicians and public men. Overloading the stomach and overworking the brain at the same time is exceedingly dangerous. The man who overworks mentally must be temperate ; he must exercise the greatest moderation in his eating, and must totally discard all stimulants and narcotics. A great share of the cases of apoplexy which occur happen when the stomach is full. The increased clearness of intellect which results from abstemiousness well repays one for all the self-denial practiced.

VEGETABLE AND ANIMAL FOOD.

There has been at various times, during the last century particularly, much and animated discussion of the question of vegetarianism. In England there exists at the present time an organization known as the Vegetarian Society, which was organized in 1847, since which time it has been actively engaged in gaining adherents to its rules, which re-

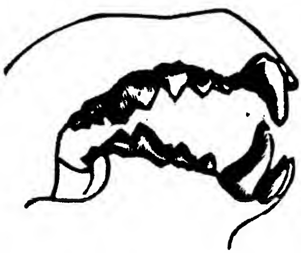


Fig. 149. Teeth of Carnivorous Animal.

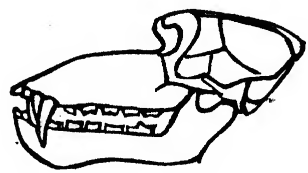


Fig. 150. Skull of Baboon. (Frugivorous.)

quire entire abstinence from flesh-meats of all kinds. The society numbers now nearly two thousand members, among whom are quite a number of men of considerable distinction. In Philadelphia, there is a sect known as the "Bible Christians" who are vegetarians, and have been such for several generations. It is stated also that John Wesley, the founder of Methodism, was a vegetarian. Scattered through nearly all civilized countries there are persons who make no use of flesh food;

Fig. 151. Skull of Wild Boar. (Omnivorous.)

Fig. 152. Skull of a Rodent.

and it is well known that the Brahmins and most of the natives of India abstain entirely from the use of flesh, from religious scruples. Several other nations, as the Chinese, Circassians, Swedes, Norwegians, Swiss, Italians, and even the Scotch and Irish, eat but little animal food. The question is an interesting one on account of its

moral, economic, and physiological bearings, and is well worth considering. The arguments urged in favor of the preference for vegetable food are substantially as follows:—

Fig. 153. Skull of the Chimpanzee. (Frugivorous.)

1. Man's anatomical structure, especially the formation of his digestive apparatus, clearly associates him with the frugivorous class of animals, represented by the gorilla and chimpanzee, the lower orders which approach most nearly to the human form. This is clearly seen by an examination and comparison of man's anatomical structure with that of animals belonging to the class referred to and those of the herbivorous, carnivorous, and omnivorous classes. This is admitted by the best comparative anatomists, and those who assert the contrary give palpable evidence that they have not carefully studied the subject. The similarity relates particularly to the teeth, the movements of mastication or mode of chewing, the size of the salivary glands, and the proportionate length of the alimentary canal. The following quotations will suffice for authority on the subject:—

Fig. 154. The Human Skull.

Said the great naturalist, Linnæus, in speaking of the dietetic character of man, "His organization, when compared with that of other animals, shows that fruits and esculent vegetables constitute his most suitable food."

Baron Cuvier, an eminent authority on comparative anatomy, regarded as one of the most learned men that ever lived, states that "The natural food of man, then, judging from his structure, appears to consist of fruits, roots, and esculent parts of vegetables."

Says Sir Everard Home, "While mankind remained in a state of innocence there is every reason to believe that their only food was the produce of the vegetable kingdom."

Mr. Thomas Bell, lecturer on anatomy and the diseases of the teeth at Guy's Hospital Medical College, London, Eng., says, "The opinion which I venture to give has not been hastily formed, nor without what appeared to me sufficient grounds. It is not, I think, going too far to say that every fact connected with human organization goes to prove that man was formed a frugivorous animal."

2. It is shown by numerous established historical facts that large portions of the human family have in ages past subsisted almost wholly, or entirely, upon vegetable food. It is well known that the early Grecians and Romans, as well as the still earlier Egyptians, were substantially vegetarian in their habits, while it is generally conceded that they enjoyed a degree of physical vigor far surpassing that possessed by men of the present day; and that they were not lacking in mental vigor is shown by the fact that among them were found men who devised philosophical systems which the world has been following ever since, and who laid the foundation for some of the most abstruse and recondite of the sciences.

3. It is also shown that a large share of the present inhabitants of the globe subsist upon a dietary containing but a very small proportion of animal food, some of these same persons being the finest specimens of physical development to be found.

4. It is argued that experience proves that persons who subsist upon vegetable food are less liable to disease, longer-lived, capable of enduring more, and superior in development to those who employ flesh food.

5. It is shown by cases which are daily becoming more numerous, that animal food is exceedingly likely to communicate disease, through disease of the animals used for food, and through changes which meat often and rapidly undergoes after death. It is also shown that all flesh food is stimulating and in some degree clogging in character, on account of its containing the excrementitious principles, or waste products, of the body, which are retained with the venous blood.

6. It is argued that as the Creator has supplied the human race with an abundance of nourishing vegetable foods, which are capable of maintaining life in its highest degree of perfection, the killing of animals for food is unnecessary, and hence immoral. The moral argu-

ment is admirably presented by Ovid in his account of the teaching of Pythagoras, who was a vegetarian from religious scruples, together with his followers, believing in the doctrine of metempsychosis, or the transmigration of souls. We quote the following passage from Ovid, respecting Pythagoras and his views:—

He first the taste of flesh from tables drove,
And argued well, if arguments could move:
O mortals, from your fellows' blood abstain,
Nor taint your bodies with a food profane,
While corn and pulse by nature are bestowed,
And planted orchards bend their willing load;
While labored gardens wholesome herbs produce,
And teeming vines afford their generous juice;
Nor tardier fruits of cruder kind are lost,
But tamed with fire, or mellowed by the frost;
* * * * * * * * *
While earth not only can your needs supply,
But, lavish of her store, provides for luxury;
A guiltless feast administers with ease,
And without blood is prodigal to please.
Wild beasts their maws with their slain brethren fill;
And yet not all, for some refuse to kill;
Sheep, goats, and oxen, and the nobler steed,
On browse, and corn, and flowery meadows feed.
Bears, tigers, wolves, the lion's angry brood,
Whom Heaven indued with principles of blood,
He wisely sundered from the rest, to yell
In forest, and in lonely caves to dwell;
Where stronger beasts oppress the weak by night,
And all in prey and purple feasts delight.
Oh, impious use! to nature's laws opposed,
Where bowels are in other bowels closed;
Where, fattened by their fellows' fat, they thrive;
Maintained by murder and by death, they live.
'Tis then for naught that mother earth provides
The stores of all she shows, and all she hides,
If men with fleshy morsels must be fed,
And chaw with bloody teeth the breathing bread:
What else is this but to devour our guests,
And barb'rously renew Cyclopean feasts?
We, by destroying life, our life sustain,
And gorge the ungodly maw with meats obscene.
Not so the golden age, who fed on fruit,
Nor durst with bloody meals their mouths pollute.

Then birds in airy space might safely move,
And timorous hares on heaths securely rove;
Nor needed fish the guileful hooks to fear,
For all was peaceful; and that peace sincere.
Whoever was the wretch (and cursed be he)
That envied first our food's simplicity,
The essay of bloody feasts on brutes began,
And after forged the sword to murder man—
Had he the sharpened steel alone employed
On beasts of prey that other beasts destroyed,
Or man invaded with their fangs and paws,
This had been justified by nature's laws
And self-defense: but who did feasts begin
Of flesh, he stretched necessity to sin.
To kill man-killers, man has lawful power,
But not the extended license to devour.
  Ill habits gather by unseen degrees;
As brooks make rivers, rivers run to seas.
The sow, with her broad snout, for rooting up
The intrusted seed, was judged to spoil the crop.
And intercept the sweating farmer's hope:
The covetous churl, of unforgiving kind,
The offender to the bloody priest resigned:
Her hunger was no plea; for that she died.
The goat came next in order to be tried:
The goat had cropp'd the tendrils of the vine:
In vengeance laity and clergy join,
Where one has lost his profit, one his wine.
Here was at least some shadow of offense;
The sheep was sacrificed on no pretense
But meek and unresisting innocence.
A patient, useful creature, born to bear
The warm and woolly fleece that clothed her murderer;
And daily to give down the milk she bred,
A tribute for the grass on which she fed.
Living, both food and raiment she supplies,
And is of least advantage when she dies.
  How did the toiling ox his death deserve,
A downright simple drudge, and born to serve?
O tyrant! with what justice canst thou hope
The promise of the year, a generous crop,
When thou destroy'st thy laboring steer, who tilled
And ploughed with pains thy else ungrateful field?
From his yet reeking neck to draw the yoke,
That neck with which the surly clods he broke;

And to the hatchet yield thy husbandman,
Who finished autumn, and the spring began.
Nor this alone! but Heaven itself to bribe,
We to the gods our impious acts ascribe:
First recompense with death their creatures' toil;
Then call the blest above to share the spoil:
The fairest victim must the powers appease,
(So fatal 'tis sometimes, too much to please!)
A purple fillet his broad brows adorns,
With flowery garlands crowned, and gilded horns:
He hears the murderous prayer the priest prefers,
But understands not 'tis his doom he hears:
Beholds the meal betwixt his temples cast
(The fruit and product of his labors past);
And in the water views perhaps the knife,
Uplifted to deprive him of his life;
Then broken up alive, his entrails sees
Torn out, for priests to inspect the gods' decrees.
From whence, O mortal man, this gust of blood
Have you derived, and interdicted food?
Be taught by me this dire delight to shun,
Warned by my precepts, by my practice won:
And when you eat the well-deserving beast,
Think on the laborer of your field you feast!
* * * * * * * * *

Ill customs by degrees to habits rise;
Ill habits soon become exalted vice.
What more advance can mortals make in sin,
So near perfection who with blood begin?
Deaf to the calf that lies beneath the knife,
Looks up, and from her butcher begs her life;
Deaf to the harmless kid, that ere he dies,
All methods to procure thy mercy tries,
And imitates in vain thy children's cries?
Where will he stop who feeds with household bread,
Then eats the poultry which before he fed?
Let plough thy steers, that when they lose their breath.
To nature, not to thee, they may impute their death.
Let goats for food their loaded udders lend,
And sheep from winter cold thy sides defend;
But neither springs, nor nets, nor snares employ,
And be no more ingenious to destroy.
Free as in air let birds on earth remain,
Nor let insidious glue their wings constrain;
Nor opening hounds the trembling stag affright,
Nor purple feathers intercept his flight;

Nor hooks concealed in baits for fish prepare,
Nor lines to heave them twinkling up in air.
Take not away the life you cannot give;
For all things have an equal right to live:
Kill noxious creatures, where 'tis sin to save;
'Tis only just prerogative we have:
But nourish life with vegetable food,
And shun the sacrilegious taste of blood.

In answer to these arguments, those who entertain opposite views urge the following among less important considerations:—

1. Though originally vegetarian in his habits, man has so long been accustomed to the use of animal food that it has come to be a necessity.

2. Those nations that use the most flesh, as for example the English, are the strongest and dominant nations.

3. The use of animal food is necessary to sustain life in the cold regions of the North, both on account of the absence of sufficient vegetable food and on account of the low temperature.

4. Confinement to the use of vegetable food would render man impotent, and thus exterminate the race.

5. Animals were made to be eaten.

6. The doctrine of evolution proves that as man has developed from lower orders to his present condition he has found it necessary to employ a more concentrated diet.

These arguments are met by counter-arguments, as follows:—

1. Long-continued violation of a principle cannot destroy it. The dirt-eaters of the Orinoco River in South America have for ages been addicted to the habit of eating clay, but this in no way alters the fact that clay is not good for them, although they have become so accustomed to its use as to seem to be little inconvenienced by it. If flesh was not the best food for Adam, for the primitive Romans, Grecians, Persians, and Egyptians, it cannot be for modern man, whose organization is essentially the same. Examination of the remains of persons who died many thousands of years ago shows that there has been no radical change in the human organization within the knowledge of man. And again, experience shows that flesh food is not a necessity, since thousands have renounced its use, and, though suffering slight inconvenience at first, have improved under the change.

2. While it is true that the English nation makes large use of animal food, and is at the same time one of the most powerful on the globe,

it is also true that the lowest, most miserable classes of human beings, as the natives of Australia, and the inhabitants of Terra del Fuego, subsist almost wholly upon flesh. It should also be borne in mind that it is only within a single generation that the common people of England have become large consumers of flesh. In former times, and when England was laying the foundation of her greatness, her sturdy yeomen ate less meat in a week or a month than the average Englishman of the present consumes in a single day. It is still true of the average Irishman that he eats less flesh food in a week than the average Englishman eats in a day. Even more might be said of the stalwart Scotchman, whose chief article of diet is oatmeal. The Persians, the Grecians, and the Romans became ruling nations while vegetarians. Other influences than diet are the chief factors in determining national supremacy.

3. That flesh food is not absolutely essential to sustain life in the Arctic regions is proven by the fact that the musk-ox, the reindeer, and other vegetable-eating animals flourish in those regions, although their food is of the most scanty kind. Again, it should be remembered that the albuminous elements, which are most abundant in flesh food, are not those which supply the largest amount of heat to the body. The heat-producing elements are the carbonaceous, of which vegetable foods contain a large proportion in the form of starch, sugar, and fat. In the narrative of the expedition of the Polaris in the Arctic regions, a quotation from the journal of Captain Hall mentions that when traveling on foot among the ice and snow, within a few degrees of the North Pole, in the month of October, when the long, dark, cold winter night had already begun, in company with his companions he lunched on graham crackers. Accounts are given of the enormous quantities of food eaten by the inhabitants of that cold country, which are supposed to be necessary to sustain animal heat, but that this is not so is proved by the fact that the crew of the Polaris maintained good health on a diet such as would not be considered extravagant for a laboring man in a mild climate, and on two meals a day.

It has been suggested, and evidently with much force, that the inhabitants of the Arctic regions are living in a very unnatural condition at the best, and that that region is manifestly not fitted for habitation by human beings. A cordial invitation is extended to them to move south.

4. The objection that the exclusive use of vegetable food would put an end to propagation is not sustained by evidence. It is cer-

tainly true that vegetable-eating nations are as prolific as others; and it is also true that some of the most prolific of animals are vegetable-eaters. If the use of vegetable food should have a tendency to lessen the intensity of the reproductive or sexual instinct in man, it would probably be no detriment to the race; and that it does have this effect, experience seems to demonstrate.

5. The assertion that animals were made to be eaten, is an assumption for which the only evidence is the fact that man does eat animals. The idea so prevalent that everything created was for man's special benefit is a most erroneous and pernicious one, as it leads human beings to overlook the fact that lower animals, although far below man in the scale of being, yet have rights which are as deserving of respect as his own, and which he is under obligations to regard. Each animal as well as each plant has its particular use in the economy of nature. There is no more reason to wonder what a sheep was made for, if not to eat, than to raise the same query concerning a mosquito or an earth-worm.

6. The doctrine of evolution can prove nothing respecting man's diet; for, as acknowledged by its most ardent supporters, it is but an hypothesis. It has not yet been proven, and it is not likely to be proven, that man was once a beast that kept company with gibbons and monkeys in the tree-tops of primeval forests. It is not necessary to consider any supposed argument founded on this basis until the doctrine of evolution has itself been established by scientific and logical evidence.

Testimony of Eminent Men.—The testimony of eminent men respecting the comparative merits of animal and vegetable food varies considerably, some asserting that a vegetable diet will not sustain life well, and others admitting that it is equal to flesh food in this particular.

Says Dr. Carpenter, an eminent English physician and scientist, "A well-selected vegetable diet is capable of producing the highest physical development."

Dr. Parkes, probably the most eminent of modern writers on hygiene, says, "The well-fed vegetable-eater will show, when in training, no inferiority to the meat-eater."

Says Dr. Tyson, in an able article on "Food and Drink" in Buck's Hygiene, "A diet too exclusively composed of animal flesh produces congestions and enlargements of the liver, and the so-called *arthritic*

or *gouty* diathesis. . . . . An excess of *oleaginous* food [always due to excess in use of animal fats] tends to produce the so-called *bilious* diathesis, characterized by excessive bile production and congestion of the liver."

The fact that animal food has a tendency to produce the gouty diathesis, urinary calculi, etc., is shown by the acidity of the urine in flesh-eaters. In the case of vegetable-eaters it is almost invariably alkaline.

Says Dr. Edward Smith, one of the most eminent English writers on Food and Dietetics, "Every element, whether mineral or organic, which is required for nutrition is found in the vegetable kingdom."

Lehman's Experiments.—The well-known experiments of Lehman show beyond question that the use of flesh food requires more work of the kidneys than a vegetable diet. When living on an exclusively animal diet he found that the amount of urea eliminated by the kidneys was two and one-half times as much as when the diet was exclusively vegetable, and one and a half times as much when he partook of both animal and vegetable food. This shows beyond question that when the diet is exclusively animal, the kidneys have more than double the amount of work to do than when it is vegetable in character; and that when partly animal and partly vegetable, they are required to do one-half additional and extra work. This excessive work must inevitably tend to the production of kidney disease, which is becoming a very common affection among the English and Americans, who, as is well known, eat more animal food than any other civilized nation.

Dietetic Importance of Meat Overestimated.—Dr. Pavy, one of the most eminent living writers on food, says:—

"The prevailing tendency, certainly in the English of the present day, is to give an undue weight to the value of animal food." "Against those who think that a large consumption of animal food is a *sine quâ non* for the maintenance of health and strength, the experience of vegetarians may be adduced."

In the effects of the Scotch prison dietaries, corroborative testimony is afforded. Dr. J. B. Thompson, resident surgeon to the General Prison for Scotland, writing in the *Medical Times and Gazette,* 1868, after ten years' experience with the same, speaks in high praise of a diet into which meat entered very sparingly, consisting chiefly of bread, oatmeal, barley, and milk, only one ounce of meat a day being

allowed. Under this diet 88 per cent maintained their original weight or gained, notwithstanding the rigor of prison discipline.

Dr. Edward Smith reports that it is not uncommon to find that among the agricultural laborers of Scotland [who are celebrated for their strength and endurance] no meat is consumed. Oatmeal is the principal diet of the sturdy Highlanders.

Dr. Guy, who made extensive investigations of the dietaries in English prisons, in his report states, as one of the deductions from his observations, "that we possess conclusive evidence of the sufficiency of a diet from which meat is wholly excluded, and even of a diet consisting wholly of vegetable matter."

A committee of the English House of Peers recently appointed to consider the question of diet in prisons, strongly advocated "not only the great economical advantages, but also the superior nutritive value of a farinaceous diet over one of flesh." The opinion seems to be gaining ground that animal food in large quantities is not good, and that human life can be well supported without it. If the English authorities try the experiment in their prisons, as it would seem probable that they may do, judging from the report referred to, we shall soon have a good opportunity of seeing vegetarianism tested on a large scale, and in such a manner as to secure conclusive results, or results which may be considered conclusive by those who are not convinced by the evidence already offered on the subject.

Meat a Stimulant.—That meat is stimulating in its effects is deduced from three admitted facts: 1. Flesh is known to contain elements of an excrementitious character which cannot be used by the system, and when taken in must be expelled; 2. A stimulant in the form of beef extract can be obtained from meat; 3. Observation shows that its effects are stimulating in character. The pulse of a person who uses flesh food freely is well known to be more rapid than that of one whose diet is vegetable in character.

Dr. Dundas Thompson, in a paper entitled, "Experimental Researches on the Food of Animals," quotes the following account of the effects of eating meat upon a party of native Indians whose diet had previously been of a vegetable character:—

"They dined most luxuriously, stuffing themselves as if they were never to eat again. After an hour or two, to his [the traveler's] great surprise and amusement, the expression of their countenances, their jabbering and gesticulations, showed clearly that the feast had pro-

duced the same effect as any intoxicating spirit or drug. The second treat was attended with the same result."

Dr. Druit, in describing before the London Obstetrical Society the properties of beef essence, attributed to it rapid and remarkable stimulating effects upon the brain, and recommended it as a substitute for brandy in cases of great exhaustion and weakness.

Dr. Edward Smith says of beef extract, "It should be classed with such nervous stimulants as tea and coffee."

Liebig, the eminent German chemist, in an article in the *London Lancet* in 1869, wrote as follows:—

"It is essentially their food which makes carnivorous animals . . . . . more combative than the herbivora which are their prey. A bear kept at the Anatomical Museum of Giessen showed a quiet, gentle nature, as long as he was fed exclusively on bread, but a few days' feeding on meat made him vicious and even quite dangerous. That swine grow irascible by having flesh food given them is well known—so much so, indeed, that they will then attack men."

It is also known that blood-hounds will become dangerous by being fed on flesh.

The following quotations from eminent authors respecting the diet of different nations and its effects, are interesting in this connection:—

Animal Diet of Icelanders, and its Effects.—We quote the following from "Mackenzie's Travels in Iceland:"—

"The diet of the Icelanders consists almost solely of animal food, of which fish, either fresh or dried, form by far the largest proportion. During the summer they have milk and butter in considerable abundance; but of bread and every other vegetable food there is the utmost scarcity, and among the lower classes an almost entire privation. . . . . . As an effect of these circumstances in the mode of life of the Icelanders, cutaneous diseases, arising from a cachectic state of the body, are exceedingly frequent among them, and appear under some of their worst forms. Scurvy and leprosy are common in the island, occurring especially on the western coast, where the inhabitants depend chiefly upon fishing, and where the pastures are inferior in extent and produce. . . . . Scurvy is observed to occur with greatest frequency at those periods when there has been a deficiency of food among the inhabitants, or when the snow and frost of the winter succeed immediately to a wet autumnal season. For its cure, a vegetable diet is employed, in as far as the circumstances of the Icelanders will

allow of such means. . . . . Inflammatory affections of the abdominal viscera are likewise very common among the Icelanders, chiefly, perhaps, in consequence of the peculiar diet to which they are accustomed.

"The diet of the Icelanders likewise gives much disposition to worms, and the ascarides are observed to be particularly frequent."

Raw-Meat Diet of the Abyssinians.—The Abyssinians are very fond of raw meat which they cut from the living animal and eat while warm. Johnston, in his "Travels in Southern Abyssinia," says, "Travelers who have witnessed their 'brunde' feasts can attest to the intoxicating effects of this kind of food, and they must have been astonished at the immense quantities that can be eaten in the raw state compared to that when the meat is cooked, and at the insensibility which it sometimes produces."

Vegetable Diet of the Mexicans.—"Accustomed to uniform nourishment of an almost entirely vegetable nature, that of their maize and cereal·gramina, the Indians would undoubtedly attain very great longevity if their constitutions were not weakened by drunkenness." —*Taylor's Selections from Humboldt's Works relating to Mexico.*

Cannibalism.—Prof. Pavy remarks that "There is reason to believe that the practice of eating human flesh has not at all times been confined to the lowest savages, but it is difficult to obtain much satisfactory information respecting it.

"There is little doubt that our ancestors, the ancient inhabitants of Britain, were guilty of eating human flesh, and St. Jerome specially charges the Attacotti, a people of ancient Scotland, with preferring the shepherd to his flock.

"There have been numerous instances of cannibalism among people suffering from starvation in sieges and from shipwreck, and the evidence is tolerably strong that some men belonging to civilized races, living in wild places, have occasionally decoyed persons to their dens and eaten them. Andrew Wyntoun, in his rhyming chronicle, charges a man who lived early in the fourteenth century with this crime.

"Lindsay, of Pitscottie, also relates that a man and his wife and family were all burnt on the east coast of Scotland for the crime of eating children that they had stolen away. During the horrors of the great French Revolution the heart of the Princess Lamballe was plucked out of her body by one of the mob, taken by him to a restaurant, and there cooked and eaten."

DISEASED FOODS.

So many instances of poisoning, often fatal, from the use of food rendered unwholesome by disease are constantly occurring, that it is evidently important to give this subject due consideration. Prof. Gamgee, of London, quoted by Dr. Letheby, health officer of the city of London, states that fully one-fifth of all the flesh sold in that great city is diseased. The amount of diseased food offered for sale in the city may be judged from the fact that more than four hundred tons of meat are sold daily in four of the principal markets. The means of inspection employed are so inadequate and inefficient that but a small fraction of the amount really unfit for food is discovered and seized. To this fact is attributed the remarkable increase in England within the last few years of deaths from boils, carbuncle, and phlegmon, the latter having increased to more than thirty-two times its former frequency.

Experience abundantly shows that animals which die of disease are unfit for food, being liable to produce in those who eat their flesh symptoms of poisoning of all grades, from a mere trifling febrile disturbance to the most rapidly fatal effects. This danger has for ages been recognized by the Jews, whose laws require of them the most careful examination of all animals, both before and after killing, to insure soundness. The written laws given in the Bible do not include the more definite instructions on this point which are said by the Jews to have been given by Moses to the people orally, since which time they have been carefully observed. A Jew will not eat flesh which has not been inspected in the most careful manner by an officer called a searcher or *bodek,* appointed for the purpose, who is required to declare under the obligations of a solemn oath whether or not the animal which he examines is fit for food. A Jewish rabbi once informed us that in many of the large cities nineteen out of twenty animals thus examined were rejected as unfit for food. The rejected animals are sold to Christians, who are less scrupulous about the character of their food, and in consequence are more subject to disease and are shorter lived than Jews.

It is a common custom with farmers as soon as an animal shows symptoms of decline in health to send it to the butcher at once, or kill it and sell the meat themselves. When an epidemic among cattle is prevalent, the markets in the large cities are flooded with the flesh of

diseased animals. Thousands of animals are consumed every year as food, whose death was only a very little hastened by the butcher. There can be no doubt that a very large proportion of all the animal food sold in the markets is more or less contaminated by disease. Domestic animals suffer with diseases essentially the same as those from which man suffers; and there is good evidence for believing that in not a small number of instances the disease is communicated from animals to man.

A trustworthy butcher informed us that not one in a hundred of the livers of hogs is found in a healthy condition. Often they are the seat of foul abscesses. The investigations and experiments of Dr. A. N. Bell, of New York City, as well as of eminent French experimenters, show that consumption is a very common disease among cattle, and that it is communicable from them to human beings. The president of the Board of Health of one of our large Eastern cities, and a professor of agriculture in one of the leading colleges of the country, stated in our hearing that consumption is a great deal more common among cows than is generally known, and especially among blooded stock, which are generally more closely kept than common breeds.

Very recently a case has been reported in which five hundred persons were stricken down with typhoid fever in consequence of eating the flesh of a calf, which, as was afterward ascertained, had died of typhoid fever. Every person who ate of the flesh of the calf was sick with the fever, the symptoms of which were characteristic, and quite a number died.

Origin of Tape-Worm.—This troublesome and quite too common affection originates in the use of meat containing the young creatures inclosed in little cysts, or sacs. There are several varieties of the worm. One of the two most common, known as the *tænia solium*, coming from the use of pork, the other from the use of beef. When taken into the system, the tiny embryos attach themselves to the mucous membrane of the intestine, and live and grow by absorbing the digested foods with which they are surrounded. They sometimes attain an enormous length, and give rise to many grave but often obscure symptoms. The only positive evidence of the presence of the worm, however, is the finding of portions of the parasite in the discharges from the bowels.

The embryos of *tænia solium* may be seen with the naked eye,

looking like small bladders in the lean meat of pork, as shown in Fig. 155. In beef the cysts are too small to be readily seen with the unaided eye. Flesh containing these creatures is said to be *measly*. This disease is very common in Ireland, where, according to good authorities, as large a proportion as three per cent of the hogs are affected. The disease is communicated to man by eating measly flesh without sufficient cooking to kill the embryos; hence it is most common among those who eat raw meat. Pork-packers and cooks are said to be most frequently affected with tape-worm, which is probably due to the habit of eating raw meat when about their work. Among the Abyssinians, whose regular diet is raw flesh, almost every person has a tape-worm.

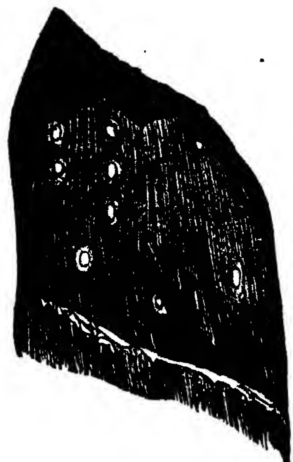


Fig. 155. Measly Pork containing Young Tape-Worms.

It was formerly supposed that the danger of acquiring this disagreeable tenant was wholly connected with the use of pork; but the researches of Dr. Leidy, of Philadelphia, during the last fifteen years, recently made public, have shown that the variety of the worm which is most common is that caused by the use of raw beef. Of the many specimens examined by him he had never yet found one of the pork species.

It need scarcely be suggested that in the light of these developments the use of raw flesh of any kind is dangerous and to be scrupulously avoided. No kind of flesh food should be used without exposure to a degree of heat at least as great as that of boiling water, and for a sufficient length of time to insure entire destruction to any living germ which may be lurking in it. Even then there is the constant liability of consuming cooked parasites along with the food, which will scarcely be considered appetizing. A very careful inspection should be made of all flesh food before it is eaten. This is required, as before stated, by the Jewish laws, and by municipal laws in some large cities; but on the whole, the modern world is behind the ancient in this particular. In Rome, many centuries ago, public inspectors made a careful examination of all flesh foods before they were allowed to be sold.

Dr. Leidy has also recently discovered that the cucumber, as

well as pork and beef, is affected with tape-worm. He found in a cucumber a well-developed worm which had evidently grown there. The disease known as *hydatids* is caused by taking into the system the eggs of tape-worms instead of the young worms in flesh containing the cysts of hydatids. It is exactly the same disease in man known as measles in pork. Sometimes a person suffering with tape-worm becomes infected. While the worm is in the intestines it is constantly giving off thousands of eggs, which are carried away with the bowel discharges, not being received into the system. Sometimes, however, through violent retching, some of the eggs are thrown up into the stomach, and then the person may become self-infected. The cysts may be formed in any part of the body. The liver is the most common seat of hydatids in man. Occasionally the eye and the brain are invaded by them. In sheep the brain is the chief seat, producing the disease known as staggers.

The Trichina.—See PLATE IX. This parasite has been so often described that we hardly need enter upon a lengthy description here. For a long time after it was discovered, the general public received reports concerning the new parasite with incredulity; but so many cases of fatal poisoning from this source have now occurred that no one longer doubts.

The trichina is found usually in pork, though it may infest the flesh of numerous other animals as well. Cases have been reported in England in which it was found in calves. It has also been recently discovered in the hippopotamus. It exists only in the lean flesh of animals, and is found among the muscular fibres, or inclosed in little sacs or capsules. It is almost always found in the latter condition. As found in these conditions the parasite is a minute, thread-like worm, about $\frac{1}{85}$ of an inch in length, and about $\frac{1}{600}$ of an inch in diameter. This is the embryonic or undeveloped form of the worm. When taken into the stomach by the eating of flesh containing it, the worm is soon liberated from its capsular prison, and in the course of a week undergoes complete development, reaching a size much greater than that described, so that it even becomes visible. During this time it is buried in the mucus of the stomach and intestines. When development is complete it speedily brings forth young in immense numbers, a single worm producing, it is stated, one thousand or more young. The young worms very quickly begin to penetrate the system, either by boring their way through the intestinal walls and

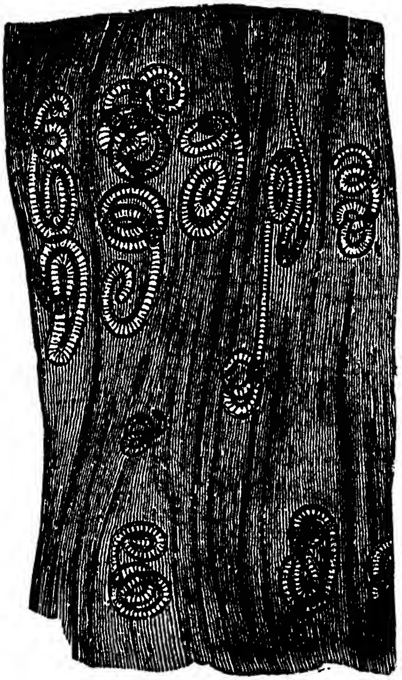


Fig. 1.

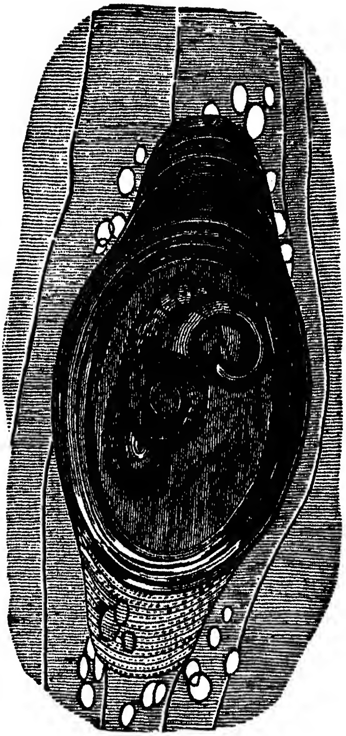


Fig. 2.

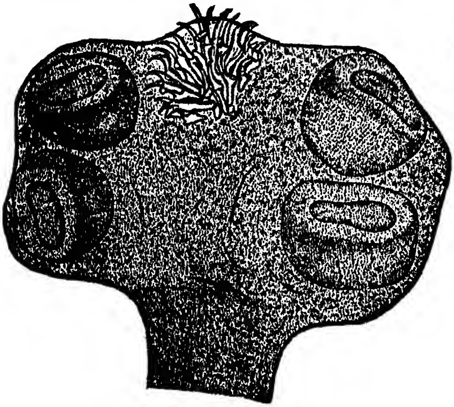


Fig. 3.

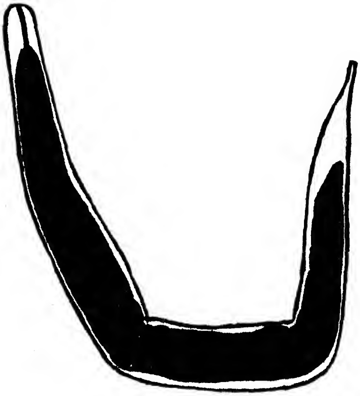


Fig. 4.

Fig. 1. Trichinæ lying loose among the muscular fibres as seen in a piece of ham newly infected. Fig. 2. Single Trichina in its capsule, some weeks after infection. Fig. 3. Head of a tape-worm greatly magnified. Fig. 4. Thread-worm.

Plate IX.—*HUMAN PARASITES.*

thence to the muscles, their final destination, or by getting into the blood-vessels and being swept along with the blood current. Which is the exact method, has not yet been determined.

After reaching the muscles it penetrates the sheaths of the fibres, and finally becoming quiet, coils itself up and after a time becomes encapsulated, in which condition it is shown in the engraving, Fig. 156. This was drawn by the aid of the *camera lucida*, from a specimen found in a piece of pork sent to us by a gentleman in Wisconsin, who was led to suspect that a neighbor had been poisoned with the parasite by the peculiarity of his symptoms, which puzzled the physicians in attendance. There were several deaths, but the cause was unsuspected, except by the gentleman referred to, until the pork was sent us for examination. The astonishing apathy of the people to the subject a few years ago was well illustrated by the fact that neither the poisoned family nor the attending physician would believe the true nature of the case, even after we published an account of the examination, with a cut of some of the worms found, but persisted in calling the disease cholera morbus, though it occurred in mid-winter.

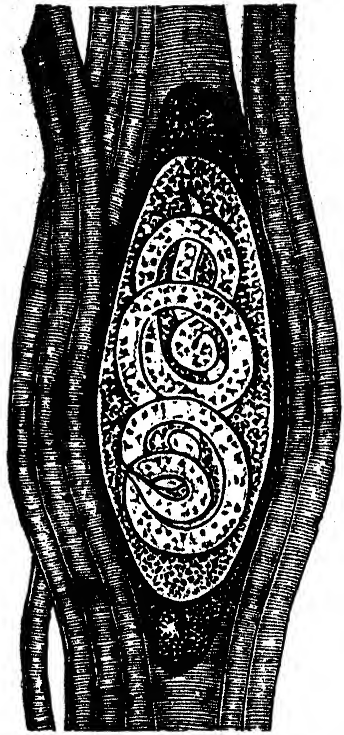


Fig. 156. Trichinæ—Two in a single Capsule. Highly Magnified.

After some months the walls of the capsules become impregnated with carbonate of lime, when they appear like small white specks, as seen in Figs. 157 and 158, which are readily seen by the naked eye. We frequently found these evidences of the presence of the worm in human muscles when dissecting as a medical student at Bellevue Hospital, New York. Prof. Janeway, then Demonstrator of Anatomy, informed us that he had observed the proportion of trichinatous bodies for a number of years, and believed that about one in twenty was thus affected. The worms were found still alive in cases in which they must have been encapsulated for

more than twenty years, so great is the vitality of these creatures. After they have once entered the tissues nothing can dislodge them; they will remain as long as the individual lives. However, they do not, as some erroneously suppose, multiply after entering the muscles. They generate but once, and in the intestinal canal.

Fig. 157. Meat containing Trichinæ in Calcareous Cysts.

Fig. 158. Same as Fig. 157. Enlarged.

The entrance of this parasite into the system, except when it is received in very small numbers, occasions a most serious disturbance of the vital functions. At first the symptoms resemble those of cholera morbus, dysentery, or some other serious bowel disturbance. When the young worms begin to penetrate the system, the symptoms become more general, and simulate rheumatism, cerebro-spinal meningitis, typhoid fever, and other diseases. This is the reason why the malady is often overlooked. Indeed, there is reason for believing that the largest share of the cases of this disease are not detected. Whether or not death results, depends upon the number of parasites received into the system and the vitality of the patient. Death usually occurs from exhaustion, but may be caused by paralysis of some of the muscles involved in respiration. That the disease is rapidly on the increase is shown by the fact that examinations of pork, made in Chicago, the greatest pork mart of the world, a number of years ago, showed the average number affected to be about one in forty. Recent examinations, made under the direction of the health officer of that city, show that at the present time one out of every twelve hogs packed in that city is infected with the disease. In some parts of the country a still higher percentage of infection is found. As there is no means of arresting the disease after a person or an animal has once been infected, it appears very probable that at no very distant date the hog race will be universally infected with this pest. Already it has been found necessary in most foreign countries open to the importation of American products, to prohibit the reception of American pork. If a law were enacted in this country requiring that the rais-

ing of the beast and consumption of its carcass should be totally discontinued, we doubt not that the result would be in the highest degree beneficial, and in no material degree damaging to the interests of the country.

The special symptoms of trichinæ poisoning, or *trichiniasis,* are further described in connection with the description of other diseases. The incurable character of the malady and the extreme liability of contracting it, seem to us to be ample grounds for discarding the use of pork altogether. The hog is well qualified to act the part of a scavenger, for which he was evidently by nature designed; but there is plenty of food for human beings far superior in quality to swine's flesh.

The Liver Fluke.—This is a small parasite which, like the dreaded trichina, is common both in man and in animals which he frequently uses as food. It has been found in the squirrel, rabbit, dog, horse, and elephant, as well as in the sheep, the deer, and the ox. It is especially destructive to sheep, which seem to be more liable to it than most other animals, being frequently infested to such an extent that whole flocks are carried off by the disease to which it gives rise. It is stated that two million sheep die in England from this cause in a single year. Thousands of sheep annually die in this country from the same cause, without the real origin of the disease being suspected.

The "fluke" is a very small creature, being flat and oval in shape, very much like a leaf. At one end is a thickened conical portion, in which are situated the head and mouth. When taken into the stomach, these parasites soon find their way into the gall duct, where they subsist and flourish with the bile for their food. In a short time, their increased numbers cause obstruction of the duct, which occasions absorption of the bile into the system, indicated by yellowness of the skin and various other symptoms. The disease is known as the "rot," or the "liver rot." When first affected with the disease, the sheep appears very much like a person suffering with the jaundice. "In a short time the sheep fails, the skin and eyes become white and bloodless, a watery tumor appears beneath the jaws, the abdomen swells from dropsy, the wool becomes harsh and easily parts from the skin, and after lingering some time, the sheep dies, completely rotten, with every organ diseased."

This disease is very common among human beings in Iceland. It also occurs in this country. The natural history of the parasite is

very curious. The eggs, being discharged from the body through the bowels, are hatched in the water. After a time they develop into minute hydatids and attach themselves to small snails. Some of them also become attached to blades of grass, water-cress, etc. Sheep become affected by eating the snails or the hydatids with grass; and there is good reason to believe that man becomes affected through eating water-cress and other aquatic plants.

The Lung Parasite.—A curious worm is sometimes found in the lungs of animals, known as the *strongylus filaria.* It gives rise to a disease resembling consumption in man, and hence must be a cause of serious deterioration to animals affected by it, rendering them wholly unfit for food.

Bilious Beasts.—That animals are subject to conditions familiarly known among human beings as biliousness, jaundice, etc., is made evident by indisputable facts. In examination of the carcasses of animals in the markets, very frequently one will be found in which the flesh has a golden tinge or distinct yellow hue. This is known to be the result of some derangement of the liver, and it is a condition which is by no means uncommon.

In Germany a regular business is made of producing diseased livers, geese being selected as the victims. This business is chiefly carried on in Strasbourg, which is world-famed for its goose-liver pies, known as *paté de foie gras.* The geese are shut up in a dark room, their feet nailed down to a plank, and often their eyes put out, so that they cannot exercise too much, and then they are regularly stuffed with corn and dough once in two hours, the food being crowded down the throat of the poor fowl with a stick. Antimony, a mineral poison closely allied to arsenic, is also fed to them for the purpose of increasing the diseased condition of the liver, by which means it is hoped to make it more tempting to French, English, and American gourmands. It requires about thirty quarts of corn to complete the stuffing process, by the end of which the poor geese are so nearly dead that it is certainly an act of mercy to kill them, their diseased livers having become so enlarged as to occupy almost the entire abdominal cavity. It would seem, however, much more appropriate that such creatures should be carried away by the public scavenger instead of being eaten as a delicacy by human beings.

Parasites in Wild Game.—The idea is entertained by many persons that even if domestic animals are subject to such diseases as *tri-*

chiniasis, measles, etc., which render them unfit for food, wild animals, fowls, and game of all sorts, are free from this objection. That this is not the case is strongly suggested by the following paragraph, which recently (1880) appeared in the *Forest and Stream*, from the pen of a correspondent of that journal:—

"Through the kindness of a professional colleague, I had the opportunity of examining a wild duck (mallard) a few days ago, which was, I think, of sufficient interest to warrant the begging of a few lines of your valuable space. The duck was infested with a large number of encysted parasites of the same general nature as the trichinæ found in the muscles of pigs: *i. e.*, an encysted form of entozoa. It had been bought in the market by a gentleman, but when his cook came to prepare it for the spit she noticed an unusual appearance of the flesh of the breast, the skin being torn in one place, and called the master's attention to it, and it was by him submitted to my friend, who, after sending out a piece cut from the heart to the Zoölogical Museum, at Cambridge, was kind enough to send the bird to me, knowing that I was interested in everything pertaining to field sports.

"The muscles of the duck were crowded with the encysted parasites, more especially the pectorals, and they seemed to be more numerous at the surface; *i. e.*, just under the skin. The cysts were from $\frac{5}{32}$ to $\frac{6}{32}$ of an inch long by about $\frac{1}{32}$ in width, being all very nearly of the same dimensions. They may be described as cylindrical, with rather bluntly rounded off ends, about the color of fat, or rather light-colored butter, and were imbedded in the muscles, between the fibres, with the long diameter parallel with the muscular fibres. I cannot think of any better well-known object to which to compare them than small pieces of that form of Italian paste which we call vermicelli. Their number may be appreciated when I say that in the space of a square inch on the breast, the skin of which had been stripped off, fifteen were seen on the surface. I have it at second hand, that Prof. Hagen, of the Museum at Cambridge, states that they are cysts of *Psorospermia*, the immature, encysted stage of the *Gregarinidæ*, and that he has never before known of these entozoa being found in the muscles of birds."

A gentleman writing recently (1895) for the *Scientific American* communicated the fact that in performing his duties as Government Inspector for trichina he had within the last year or two noticed

with extreme frequency a heretofore undescribed parasite in hogs. The parasites were present in great numbers, and in a large proportion of all the hogs examined.

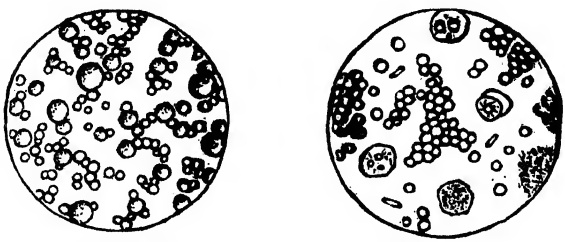
Parasites and new diseases among animals are constantly coming to light. Parasites are found in fish with very great frequency. No less than fourteen different parasites have been observed among the fish of New York harbor alone. Association of man with domestic animals is in the highest degree calculated to promote the development of parasitic diseases in both.

A note from Dr. Hagen, of Harvard University, to the editor of *Forest and Stream*, confirms the observation above described, and states that the *Psorospermia* is also very common in hams, about ten per cent of which are affected. In the ham the parasites are much smaller, and hence are not so easily discovered as in the duck. Dr. Hagen also mentions the discovery of disgusting parasites in bear-flesh. He says, "I received yesterday bear-flesh from the market. It contained in the cellular tissue next to the veins, cysts containing thin white worms, four inches long and less than one-twelfth thick. This is a very interesting parasite, described in 1672 by Fr. Redi, Italy, and since seen by nobody. Rudolphi quotes it as *Strongylus ursi*, and Diering as *Nematoidium*, but both only after Redi's description, which was made after the parasites of the European brown bear, which is the same species with our bear."

Effects on Animals of Abuse and Violent Exertion before Slaughtering.—The exhaustion and suffering incident to a long ride on the cars, often without sufficient food and water for days, or long drives in the hot sun, over dusty roads, producing a feverish condition of the system, is seriously damaging to the flesh as food. The same may be said of animals which become much excited while being slaughtered. Prof. Liebig gives an account of a family of five who were violently poisoned by eating the flesh of a deer which had been caught in a trap and struggled violently before it was killed. The flesh of such animals is very tender, because decomposition really begins before the animal dies, so greatly are the tissues disintegrated. It is observed that the flesh of such animals decomposes very quickly, becoming putrescent much sooner than usual. It was once a custom in England to "bait the bull," that is, tease him with dogs, before slaughtering, so as to make the meat tender. The New Zealanders had a practice of hanging animals up by their hind legs and whip-

ping them to death. This is said to make the flesh very tender. Such practices are most inhuman; and the use of such flesh must be in the highest degree injurious.

Diseased and Poisoned Milk.—Numerous experiments and observations in this country and England show that milk may become a means of spreading disease far and wide in two ways: 1. By communicating disease from diseased animals; and, 2. By being the carrier of contagions, infections, or other forms of germs by disease which is produced in those who make use of it.



Healthy Milk. Diseased Milk.

Fig. 159.

1. It is now well established that the milk of animals suffering with pulmonary disease or consumption will communicate the disease to human beings as well as to other animals. The most serious consequences have resulted from the use of milk from animals affected with "milk sickness," "foot-and-mouth disease," the "trembles," and various other maladies. In Fig. 159 may be seen a specimen of healthy milk compared with that which is diseased.

2. Many well-authenticated instances are recorded in which typhoid fever, diphtheria, scarlet fever, and possibly other diseases, have been spread over whole communities through the medium of milk. This has most often happened through the adulteration of milk with water contaminated with the diseases mentioned, but cases have occurred when the only possible means of contamination was through the washing of the cans with impure or contaminated water. We are acquainted with the circumstances of an epidemic of typhoid fever in which we were able to trace the origin of a large proportion of the sixty cases which occurred to the use of milk from cows watered from a well in the barn-yard.

Sterilized Milk.—This is the scientific name for milk which has been rendered germ-free by boiling. Cow's milk should never be fed to young children without being first boiled. Although free from germs when it first comes from a healthy cow, milk very quickly becomes infected with myriads of these enemies of life to which

thousands of infants annually succumb. By boiling, these are killed, and the alimentary canal is thus kept free from the poisons which they generate in the process of growth, for which they find the most favorable conditions in the stomach and intestines.

To sterilize milk, place it when fresh from the cow in soda-water bottles, using as many bottles as necessary for the quantity of milk to be sterilized. Fill each bottle to within an inch of the top. Boil for ten minutes in a steamer or boiler. Stop the bottles tightly with a rubber cork, and boil for twenty minutes more. See that the corks are tight and well secured. Care must also be taken that the bottles and corks used for the purpose are scrupulously clean, and to insure this they must be not only well washed, but boiled for at least half an hour before using.

By the adoption of this precaution, thousands of lives would be saved annually. Boiled milk is not only free from germs, and so not likely to sour, but it is more easily digested, as it does not form large curds in the stomach as does raw milk. To render milk a perfect food for a young child, it should be enriched by the addition of cream in the proportion of an ounce of cream to a gill of milk. This should be diluted, of course, with the proper amount of water to adapt it to the age of the child ; say with an equal quantity of water for a very young child, and half as much water for a child between one and two years of age. Such food is as digestible as mother's milk, and is no more likely to cause disease.

Cheese Poisoning.—Every eater of cheese ought to be informed of the fact that ripe cheese always contains poisonous substances, produced by the action of germs. These are not ordinarily present in sufficient quantity to render their presence apparent by seriously toxic symptoms ; but the fact that the cheese-eater may at any time swallow unawares a fatal dose of cheese poison, or a dose of sufficient size to imperil his life and entail great suffering, is evidenced by the frequency with which cases of cheese poisoning are reported. Some months ago, over two hundred cases were reported to the State Board of Health of Ohio, all occurring within a few days. The symptoms were vomiting and great pain in the stomach, violent purging, lasting from twelve to forty-eight hours, great prostration, and in some cases syncope.

The Inhabitants of Cheese.—According to Prof. Adametz, perfectly fresh cheese contains to every gram (fifteen grains) from 90,-

000 to 140,000 microbes. The population of a soft cheese twenty-five days old was found to number 1,200,000 for every gram, while the same quantity of a cheese forty-five days old, was found to contain 2,000,000 microbes. It was observed that the microbes were much more numerous near the outer portion of the cheese than in the center, probably due to the fact that proximity to the air favors their growth. One soft cheese examined was found to contain, near its outer surface, from 3,600,000 to 5,600,000 germs, in a quantity of cheese barely equaling in size a small marble. Combining many observations, it was found that cheese, on an average, contains in every pound nearly twice as many germs as there are people upon the face of the earth.

Notwithstanding these scientific facts, there are doubtless many persons who will continue to consume, under the name of "cheese," the usual quantity of decayed milk; and after swallowing some millions of microbes at a meal, will wonder why they suffer from sour stomach, heart-burn, flatulence, biliousness, and a variety of other symptoms which are due to germs.

Effect of Diet upon Meat, Milk, and other Animal Foods.— The effect of food upon the flesh of animals in rendering it unwholesome has already been referred to in another connection. We wish only to call attention here to a few of the more common dangers. In certain parts of the country and at certain times of the year, the flesh and milk of cows is rendered unwholesome by their eating plants poisonous to human beings. There is reason to believe that both the flesh and the eggs of fowls are affected in a similar manner, by the use of bad food. Both fowls and hogs are very apt to eat carrion and other foul substances which come in their way, which cannot be otherwise than detrimental to their flesh and to the eggs of fowls. This subject has received little or no attention, but we believe it to be important. It is well known that in certain parts of the country some varieties of birds, especially pheasants, are likely to be poisonous. This is said to be the case in Pennsylvania, where it is supposed to be due to their eating laurel buds. Fish of some kinds are sometimes poisonous at certain seasons of the year, and some varieties of fish are always poisonous, producing death when eaten, almost as quickly as prussic acid. Persons have been known to expire with a morsel of the fish in their mouths yet unswallowed. Danger of this kind is chiefly confined to the tropics.

Another similar danger, but recently recognized, exists nearer home,

in the case of oysters, mussels, and various shell-fish. As is well known, these mollusks are the scavengers of the sea. They subsist upon the decomposing organic matters which they find in solution in the water in which they live. For greater convenience in marketing, extensive beds of oysters and clams are planted near large cities; and it not infrequently happens that they feed and fatten on the filth from sewers which empty into the sea in the vicinity of the beds, or which is brought to them by the tide. Not long since, the *London Lancet* called attention to this danger, stating that many cases of illness are undoubtedly attributable to the use of this unwholesome food. Shell-fish of all sorts are very poor food at the best, and are not worth the risk necessarily taken in eating them.

In France and Belgium, oysters are made, if possible, still more unwholesome by keeping them for several months in stagnant water until they become bloated and green, when they are served up to tickle the depraved palates of French gourmands. Such food cannot but be productive of injury to those who consume it, although the real cause of the maladies from which they suffer is sure to be overlooked. Violent poisoning from the eating of clams, oysters, snails, and lobsters, is not an uncommon occurrence.

At a Sanitary Convention held in Detroit, Jan. 7 and 8, 1880, under the auspices of the State Board of Health of Michigan, the first convention of the kind in America, a physician of that city read a valuable paper on the supply of milk in cities, in which he called attention to the injury likely to result from the use of milk from cows fed on unwholesome food. He remarked as follows on this point :—

"There is no doubt that much of the mortality of children can be set down as resulting from the use of adulterated milk, or what is just as bad, milk made from unwholesome food. The milk that a cow gives is largely determined by the food she eats, and in order to get good wholesome milk you must feed good wholesome food. If you feed swill, you must expect swill-milk."

Dr. Bell and others have shown that much of the infant mortality in New York City in past years has been due to the use of milk from cows fed on distillery slops, and known as swill-milk. We are convinced, by observation, that the evil is not confined to cities. We have often known farmers to feed their cows on the swill and slops from the house, and it is a very common thing to keep cows shut up in the summer time for weeks in inclosures where their only opportunity to quench their

thirst is afforded by a stagnant, slime-covered mud-pool. Milk from cows kept under such conditions cannot but produce disease.

It may also be mentioned here, perhaps, as well as elsewhere, that the treatment of cows must affect the character of milk in a marked degree. The effect of anger in a mother upon a nursing child through changes in the milk are well known. It is then evident that ill treatment which may excite an animal to rage before or during milking may cause such changes in the milk as will affect the consumer deleteriously. Children, whose power of resistance to morbid influences is much less than that of grown people, would be especially liable to injury from this source.

Fig. 160. Spurred Rye or Ergot.

Attention has also been recently called to the importance of securing healthy persons to milk cows and care for milk in connection with dairies, since it has been suggested, on very probable grounds, that one of the vilest and most ineradicable of all diseases may be communicated through the medium of milk by persons affected by the disease, especially when employed as milkers.

Fig. 161. Ergot Grains Enlarged.

Diseased Vegetable Foods.—Although more rarely affected by disease, some forms of vegetable food are subject to unnatural conditions which sometimes become a serious cause of disease. Perhaps the most common and serious malady induced in this way is that known as *ergotism*, which results from the use of flour from what is termed spurred rye or wheat. Barley, rice, and other grains are also affected. Ergot is a fungus botanically known as *Claviceps purpurea*, which in wet seasons grows upon the grains mentioned. Previous to the eighteenth century the disease was much more common than it is now, since its cause is known and avoided. Extensive epidemics have occurred, which have sometimes been very fatal, the persons poisoned dying of exhaustion after suffering untold agonies from tetanic convulsions. Gangrene occurs in one form of the disease. Figs. 160 and 161 are illustrations

of this poisonous fungus. The presence of ergot in flour may be detected by the violet color, peculiar odor and flavor of the bread made from it, and by the following chemical test: Make a paste of the flour, and add a little dilute nitric acid. The appearance of a red color is evidence of the presence of ergot. The addition of caustic potash should change the red to violet. Another method is to add caustic potash and heat the mixture. If ergot is present, it will be shown by a characteristic odor resembling that of herrings.

Fig. 162. Flour Infested with Rust, as seen under the Microscope. (Hassall.)

Dr. B. W. Richardson of England holds that *cerebro-spinal meningitis*, a most fatal malady, is due to ergot poisoning and to the use of bread made from grain affected with smut. A report of an epidemic of this disease, made in 1875 by Dr. H. B. Baker, Secretary of the State Board of Health of Michigan, affords evidence in support of this view. Grain of this description should, of course, never be used for food.

Pellagra, a disease which occurs particularly in Lombardy, is supposed to be due to the use of corn affected by a fungus. The skin becomes dry and wrinkled, the mind and nervous system are powerfully affected, and convulsions occur similar to those observed in ergotism.

Rust, Red-Rag, or Red-Gum.—A fungus growth which often affects wheat is known by each of the above names in various parts of this and other countries. There are grounds for suspicion that flour infested with this fungus is a cause of serious disease. Fig. 162 shows wheat flour which is infested by the spores of the rust fungus. Fig. 163 shows the mature plant.

Smut Bolls, or Pepper Brand.—The spores seen in Fig. 164 represent very fairly those produced by the fungus of that name which is a later form of the rust fungus.

Animal Parasites.—The *weevil* and *midge* are the most common parasitic insects destructive to grain. In the case of the weevil, the center of the grain is eaten by the insect, leaving merely a shell. The midge is injurious through the voracity of the yellow maggots or caterpillars that develop from eggs deposited in the blossoms of the wheat, which is thus rendered worthless, through the failure to develop grains.

Another very curious parasite is *ear-cockle*, or pepper-corn, which is thus described by Hassall: "The grains affected turn green at first, and ultimately black; they become rounded, resembling a small pepper-corn; the husks are spread out and the awns twisted, by which means the infected ears are readily observable amongst the standing corn. The blighted grains are filled with a moist,

Fig. 163. The Rust Fungus (Hassall).

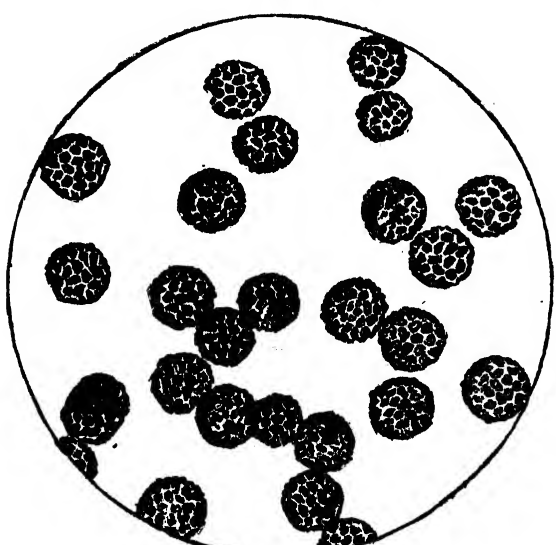


Fig. 164. Spores of Smut Bolls (Hassall).

cotton-like substance, and contain no flour. This substance is composed of myriads of eel-shaped animalcules, which, as soon as moistened with water, exhibit the most active movements. A most extraordinary circumstance connected with these animalcules is that they may be so perfectly dried that on the slightest touch they break up into powder, and yet, when moistened, they will revive and become as active as at first. This operation may even be repeated several times before the vitality of the animalcules is fully destroyed."

The Meal-Mite.—Damaged flour is often infested by mites very closely resembling the sugar-mite and its near relative, the itch-mite. One variety of this species of *acarus* is to be seen on PLATE X, together with the sugar-mite.

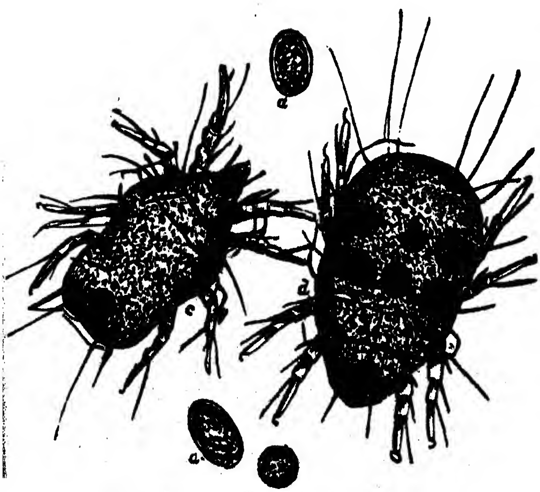
The Sugar-Mite.—Brown sugar is very liable to be infested with a parasitic insect closely resembling the itch-mite, of which it is a near relative, as well as of the *acarus folliculorum* of the sebaceous follicles. It is known as the *acarus sacchari*. The disease known as grocers' itch is produced by this insect, which burrows into the hands of those who handle the cheap grades of brown sugar, especially those known as raw sugars. The insects cannot be seen without a microscope. A very good representation of the sugar-mite is shown in PLATE X.

Decayed Food.—It has been clearly shown by numerous cases, that the use of decayed or moldy food is dangerous to health and life. Probably decayed flesh is the most dangerous. More than four hundred cases of poisoning from the use of moldy sausage have occurred in Würtemburg, Germany, within the last fifty years, one hundred and fifty of which have been fatal, from which it will be seen that the use of such food is in the highest degree dangerous.

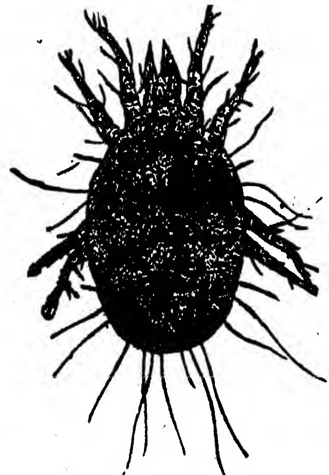
Cases of most severe poisoning have occurred from eating moldy bread, decayed cheese, milk which had been kept in cans not well cleaned, and canned meat which had undergone a species of decomposition which cannot be detected by the smell or appearance, but which renders the meat extremely poisonous. Fish is much more apt to undergo this peculiar change than other kinds of food.

As is well known, meat is much more tender and has a higher flavor after being kept sufficiently long after killing the animal to allow decomposition to begin. When decay has progressed so far as to give to the flesh a distinctly putrescent odor, it is said to be "*high*." Game of all sorts is usually eaten in this condition. In Europe it is generally customary to allow all meat to get very "high" before it is

Meal Mites in Meal.



Meal Mites greatly magnified.



Sugar Mite.

PLATE X.

considered fit for the table. In France the degree of putrescence desired is generally greater than in England. Many wild tribes much prefer their food in a state of decay. Decomposed fish, under the name of *gnappee*, is said to be considered by Burmese epicures as one of the choicest of dainties. The loathsome stuff is thus described by a correspondent of the London *Times*:—

"This horrible mass of putrefaction is one of the choicest dainties of the Burmans. A quantity of fish, caught in the sea, is pickled, and then buried in the earth, and left there to attain the desired pitch of rottenness, for a time varying from one to four years, according to the taste of the particular market for which it is destined. Just as the wine manufacturers of Epernay and Rheims give to their champagnes particular flavors to meet the various tastes of their clients, so the dealers in *gnappee* are said to prepare their delicate commodity. Whether kept for one or four years, it is absolutely putrid, and swarming with loathsome animal life. Not only do the Burmans love the horrible viand itself, but they actually revel in its effluvium, and the native passengers on the flats which carried it nestled and snuggled up to the vicinity of the nastiness, inhaling its stench with as much gusto as a hungry London gamin sniffs the odors of a cook-shop. Can human beings consume this loathsome putridity without suffering evil consequences? I remember on the eve of my departure for a previous visit to India, that Mr. Jonathan Hutchinson, the eminent surgeon, asked me to observe, if I had the opportunity, whether the salt fish on which a large proportion of the population of the Indian sea-board subsisted, appeared productive of any specific disorder. The opportunity for such an inquiry did not then offer itself; but in Burmah there are two facts which may have some relation one to the other: that this putrid, pickled fish is an extensive article of consumption as human food, and that leprosy is so prevalent in the jail of Rangoon that it is found necessary to have a special ward for lepers."

The same writer also suggests that the destructive outbreak of plague which occurred in Astrachan was probably largely due to the use of this kind of food.

While food which is far advanced in decomposition many times seems to be eaten with impunity, there is good reason, as intimated above, for believing that food of this character may be an active cause of loathsome and very fatal diseases. Not infrequently, too, acute and fatal poisoning occurs.

Serious sickness frequently arises from the use of stale eggs, especially in the summer time, when it is often difficult to obtain eggs that are fresh. Eggs keep perfectly fresh in hot weather only three or four days.

During warm weather, eggs speedily undergo changes akin to putrefaction. The shell but partially protects its contents from the destructive action of germs, unless it is rendered impervious by the application of some substance capable of filling the pores so that the air cannot pass through.

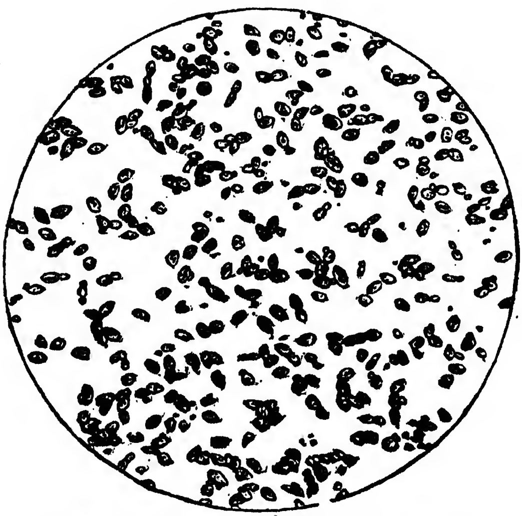


Fig. 165. Spores of Yeast Magnified. (Hassall.)

An English gentleman who has investigated the subject quite thoroughly, finds, upon a careful microscopical examination, that stale eggs often contain certain peculiar cells of a fungoid character. These seem to be developed from the yolk of the egg, that portion which should furnish the material to form the flesh and bones of the chick which the egg would have produced by development under favorable conditions. Eggs containing these cells produced a poisonous effect upon dogs to which they were fed. We knew a case in which a whole family were seized with violent purging in consequence of the use of stale eggs; at least the difficulty could be assigned to no other cause.

Eggs grow lighter as they grow older, by the evaporation of their fluid contents, causing the internal portion to shrink. This leaves a small air space at one end, which becomes larger as the egg is older, and if it is very stale it will float when placed in water. Such eggs should be discarded as unfit for food.

Rotten Cheese.—When fresh made, cheese is not an unwholesome food, though rather difficult of digestion; but when it has passed through the process of curing, or maturing, which is really a

process of decay, it is wholly unfit for food, being difficult of digestion, and likely to interfere with the digestion of other food. Some kinds of cheese, especially those of foreign make, as the *limburger*, is utterly loathsome to all unperverted tastes, and should on no account be eaten. Cheese often contains a peculiar grub, the larvæ of a species of fly, commonly known as *skippers* or *jumpers*, from their jumping powers. If a man could leap as high in proportion to his length as a skipper, he could easily spring over a steeple one hundred feet high. Another parasite which infests cheese is known as the cheese-mite, which so closely resembles the itch-mite, or *acarus scabiei*, that it is not necessary to represent it.

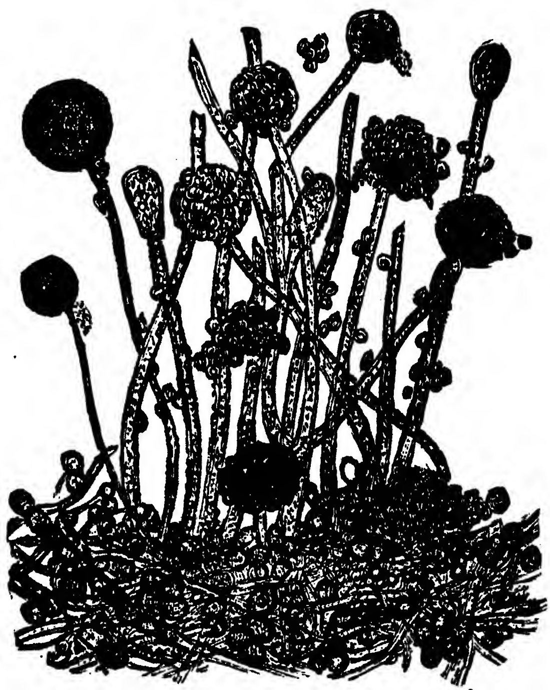


Fig. 166. Yeast Fungus Magnified. (Hassall.)

Yeast and Mold.—One of the most active agents in the production of decomposition is the yeast fungus, the spores of which are well shown in Fig. 165, and the fully developed fungus in Fig. 166. This is the effective agent in the fermentation of beer and wine, the raising of fermented bread, the "working" of cider, etc. It is the presence of many of the spores unaffected by the heat which renders the use of fermented bread objectionable in some cases of dyspepsia. Compressed yeast consists of the spores of the plant dried and compressed. With the aid of warmth and moisture, fermentation will take place spontaneously, as the air constantly contains many of the yeast germs, or spores, which find ready access to fermentable substances and induce their peculiar process.

Fig. 167 is a representation of the green mold so often seen on old cheese, stale bread, and other articles of food, as seen under a good microscope. It is by no means a harmless fungus, as the most serious illness has frequently resulted from the use of food affected with mold. In one case a whole family were poisoned by eating a pudding which contained a few pieces of stale and moldy bread.

Fig. 167. Green Mold of Old Cheese and Stale Bread. (Hassall.)

Stale Vegetables.—The use of stale vegetables is often a cause of serious disturbance of the bowels, especially early in the season, when many kinds of vegetables are taken to market in an unripe and immature state. Vegetables and fruit keep fresh much longer than animal foods; but when kept in the vicinity of strong and offensive odors, they absorb bad gases and may thus become unwholesome. Fruits and vegetables which have begun to decay are unfit for food. Potatoes and other vegetables which have begun to sprout much are not fit to be eaten. Potato sprouts contain a poison which may produce serious results, as it is of about the same nature as belladonna and other poisons of that class.

Vegetables can be best kept in a wholesome condition by storing in a cool, dry place. The damp, dark vegetable cellars, usually located under a house or barn, are anything but wholesome. The vegetables rapidly deteriorate in quality, and the poisonous gases generated by decay ascend into the house to poison and sicken its inmates.

ADULTERATIONS OF FOODS AND DRINKS.

The present seems to be an age of fraud and deception, and in no direction is the prevailing tendency more manifest than in the adulteration of food. It would seem that of all forms of adulteration this would be the last to be thought of or perpetrated; but so great is the cupidity of men in search of wealth that they do not hesitate to seize upon every opportunity for sophistication of food or drink of any description, utterly regardless of the consequences to the consumers of the vile compounds. In many countries this evil has grown to such magnitude that it has by law been recognized as a criminal offense, to be visited with punishment when detected. Notwithstanding all laws, however, the nefarious business flourishes, and especially in a country like this, where there is as yet not adequate legislation to control it. The punishment usually inflicted, when the crime is recognized and the offender tried and convicted, is so slight that there is no hesitancy in repeating the attempt to defraud the consumer, by sophisticating any article of food or drink he may purchase. We would suggest that an excellent means of punishment in many cases would be to compel the person found guilty of adulteration to consume the adulterated articles himself, and thus feel the actual effects of his crime. Such a mode of punishment would soon put a stop to the worst forms of adulteration, at least.

Modes of Adulteration.—The different forms of adulteration may be classified as *injurious, fraudulent,* and *accidental.* In one or the other of these ways a large share of the articles employed as food or drink have been adulterated to the serious detriment of either the health or the pocket of consumers. Some of the more serious of these adulterations we will now notice, also describing, so far as may be practically useful, the best modes of detection.

Hassall, in his very excellent work on the adulterations of food, enumerates the following formidable list of injurious substances actually found in different articles of food:—

Cocculus Indicus, arsenite of copper, emerald green or Scheele's green, sulphate of copper, or blue vitrol, acetate of copper, or verdigris, carbonate of copper, verditer, chromate of lead, red oxide of lead, Venetian red, bole Armenian, red and yellow ochres, umber, carbonate of lead, plumbago, or black-lead, bi-sulphuret of mercury, or cinnabar, sulphate of iron, cayenne, gamboge, chromate of potash, Brunswick

green, indigo, Prussian blue, Antwerp blue, ultramarine, alum, sulphuric acid, and bronze powders, besides chalk, plaster of Paris, terra alba, and other substances in some degree injurious, though not actively poisonous.

Let us now consider in detail some of the substances contaminated, and the modes of detecting the adulterants.

Bread.—In this country, where good flour is usually moderate in price, adulteration of bread is not as common as in England and some other foreign countries; there is no doubt, however, that adulteration is not uncommon even in this country, especially in the large cities, and particularly in the bread supplied to the poorer classes. The objects of the adulteration of bread are the production of a loaf of good appearance from inferior flour, and the retention of a large proportion of water so as to increase the weight, as in many cities the weight of loaves of a certain price is regulated by law. For this purpose alum is more frequently used than any other substance, as it produces the desired effect. Sulphate of copper has also been used, but seldom. Alum is very deleterious to the digestive organs, producing bad dyspepsia when long used. Hence, its detection is important. The following is a simple method which any one can employ:—

Detection of Alum in Bread.—The simplest method is to dip a slice of the suspected bread in a solution of logwood in water (either the extract or fresh chips may be employed). If alum is present, the bread will become a claret color. A more precise method is the following: Macerate in three or four tablespoonfuls of water a half slice of bread; strain off the water, and add to it twenty drops of a strong solution of logwood. Then add a large tablespoonful of a strong solution of carbonate of ammonium. If alum is present, the mixture will be changed from pink to a lavender-blue. This test will discover a grain of alum in a pound of bread.

To Detect Blue Vitriol in Bread.—Dissolve some of the bread in warm water. Add a strong solution of prussiate of potash. If copper is present, a chocolate color will appear.

Flour.—Wheat flour is sometimes adulterated with alum, ground rice, grit, and sand. Potato starch was formerly used, when flour was very high in price, but is now seldom or never employed for this purpose. Flour is sometimes contaminated with lead, which comes, together with the grit and sand, from the wheat being ground with newly cut stones, and with stones the grinding faces of which have

been repaired with lead. A number of cases of lead poisoning from this cause have been reported. Flour is also adulterated by admixture with inferior grades, and with flour made from musty or grown wheat. Such flour should not be eaten.

Alum may be detected in flour by the same method described for bread. The adulteration with rice and potato starch, with sand and metallic lead, may be detected by means of the microscope.

Butter.—Formerly the only adulterants employed in butter were excess of salt, starch, and *annatto*, a peculiar coloring matter, which

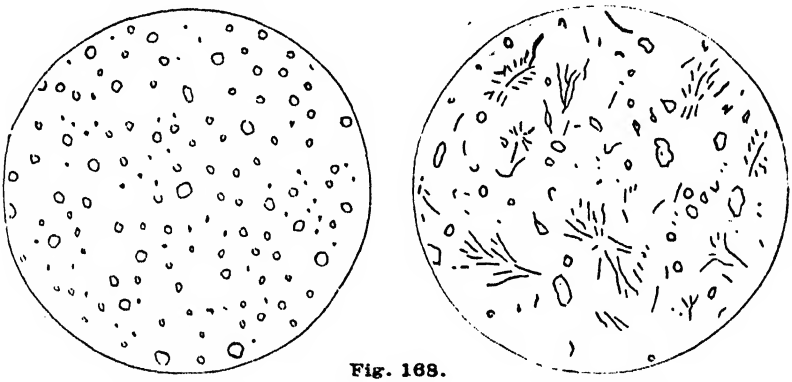


Fig. 168.

Genuine Butter. Oleomargarine.

is itself often adulterated with gypsum, red lead, and blue vitriol. Within the last few years, however, an immense business has sprung up in the manufacture not only of adulterated butter, but of an article which is wholly counterfeit. This fraudulent article is known to the trade as oleomargarine butter; but the article is retailed to consumers as genuine. Immense quantities of lard and tallow are manufactured into bogus butter in the larger cities of this country, as well as abroad. This artificial butter is often found to contain portions of flesh, membranes, and muscular tissue; and undoubtedly much of it is made from diseased hogs and cattle. It is highly probable that both tape-worm and trichinæ may be communicated by this article. Fig. 168 shows the contrast between genuine and artificial butter as seen under the microscope, the only means of detection.

The presence of annatto is shown by the unnaturally deep color of the butter. Other adulterants are easily detected by melting the butter with a gentle heat which causes them to separate.

Milk.—No article of food of general consumption is so frequently adulterated as this. The most common adulterant is water. It is said that chalk, annatto, burnt sugar, infusion of sheep's brains, and salt are also added in some cases. A fraud is also practiced in skimming the milk, or a part of it, before taking to market. The substances commonly added are not often actually poisonous in themselves, although numerous cases of typhoid fever have occurred, in which the disease was traced to the use of milk which had been adulterated with foul water. It is probable that diphtheria, and perhaps other diseases, are occasionally communicated in the same manner. Milk may also be contaminated with lead from the use of water containing this poison, and from standing in lead or zinc vessels.

It is not always easy to detect adulterations in milk without a careful analysis; but any unnatural appearance or unpleasant odor should cause it to be rejected at once. Milk should be purchased only of reliable parties, and careful inquiry should be made respecting the care of the animals from which it is produced, as one of the most dangerous means of adulterating milk is feeding cows upon unwholesome food, and keeping them in close, foul, unventilated stalls. Under these circumstances, especially when the secretion is greatly prolonged beyond the natural period, as in cows known as "farrow," the milk secretion really becomes an excretory product, and contains quite a large proportion of the waste matters of the system. Such milk is totally unfit for human food, and when fed to children, especially, will be certain to produce very marked and disastrous results.

Sugar.—The different varieties of sugar, sirup, and honey, are the subject of frequent and extensive adulteration. It has long been known that sugar could be manufactured from starch by boiling it for some time with dilute sulphuric acid. By a slight variation of the process, sugar can also be made from woody fibre of all sorts, as cotton, sawdust, shavings, etc. The sugar thus made is called glucose, as it closely resembles the sugar of grapes. It is much inferior to cane-sugar in sweetening properties, and does not crystallize, as does cane-sugar. It possesses chemical properties in several respects different, by means of which it is readily distinguished. In the manufacture of glucose the sulphuric acid is neutralized by chalk, but as it is not always wholly removed, a portion may be retained in the sugar in a free state, as well as combined with iron in consequence of the contact of the acid with iron during the process of manufacture.

On account of the non-crystallizable character of glucose it cannot be readily mixed with the coarse granular sugars, but it is used in large quanities in the fine granulated and pulverized sugars.

The cheap grades of sugar have often been adulterated with plaster of Paris, sand, clay, bone-dust, and numerous similar substances used to increase weight. Recently the astonishing discovery has been made that chloride of tin, an exceedingly poisonous salt, is used very extensively for the purpose of bleaching colored sugars, and is not wholly removed by the refining process.

The presence of glucose in sugar can be easily detected by the following method: Dissolve in a test-tube half a teaspoonful of the suspected sugar, in two teaspoonfuls of warm water. Add six or eight drops of a strong solution of blue vitriol. This will give to the solution a faint blue tinge. Now add a solution of caustic potash. This will deepen the blue color greatly, and produce a curdy appearance. Continue to add the potash until the solution becomes clear, shaking the test-tube frequently so as to mix the contents well, and then heat to boiling in the flame of a spirit-lamp. If grape-sugar is present, as the liquid approaches the boiling point a yellowish color will appear, which will soon deepen to orange, then orange red, and deep red. The changes in color are due to the precipitation of red oxide of copper, which is the chemical test for grape-sugar.

The inorganic adulterants of sugar mentioned can be readily detected by dissolving the sugar, when they will appear as a sediment.

Sirup.—Sirups are still more extensively adulterated than sugars, as the fraud is much more easily covered in them. Seven years ago (1873), we examined a large number of specimens of sirup of every grade, varying in price from eighty cents to two dollars per gallon, and found ninety-five per cent of them grossly adulterated with sugar made from the refuse of corn-starch factories. Much of this kind of sirup is also made from potato starch. In the West there are several large firms exclusively engaged in the manufacture of artificial sugar from corn. Probably the most serious injury from the use of these sirups arises from the sulphuric acid which they contain, sometimes in considerable quantity, besides quite large quantities of iron in some cases. We have known of instances in which serious injury has been done by this fraudulent stuff. A case is reported in which the cork of a jug of sirup was said to have been considerably corroded while on the way to a lumberman's camp. In a case which came

under our observation a party of young persons had what was termed a "candy pull," making candy of sirup which had been purchased as "golden drip." The next morning every one who had eaten of the candy found his tongue and teeth as black as ink, from the action of the chemicals contained in the sirup. Such compounds must certainly be wholly unfit to be put into the stomach of any human being.

This fraud is not always easy to detect, but it may generally be discovered through the action of well-known chemical re-agents upon the sulphuric acid and iron which it is almost certain to contain. These substances may be detected by the following means:—

Test for Iron.—It is well known that iron forms with tannic acid a black compound. It is by this means that ink is made from oak-bark or logwood and salts of iron. Hence by adding a little of the sirup to a solution of tannin, it will become black. Common tea contains tannin in sufficient quantity to make a good test. Into half a cup of moderately strong, clear tea put a teaspoonful of the sirup. If the tea becomes black, iron is present in the sirup. It is true that the iron itself in very small quantities may not be productive of great injury, though in the quantities in which we have found it we think it might do harm; but a knowledge of its presence is of value as indicating the probable presence of sulphuric acid and of glucose. Sirup or sugar which will blacken tea may well be suspected and avoided.

Test for Sulphuric Acid.—Procure at a drug-store a dram of nitrate or chloride of barium. Dissolve in a few spoonfuls of water. Dissolve some of the sirup in warm water in a test-tube or clear, clean vial. Add some of the barium solution and shake. Set aside for half an hour. If a white powder appears at the bottom of the vial as a sediment, the sirup undoubtedly contains sulphuric acid, and should be rejected.

The adulteration of sirups is so common that it is entirely unsafe to purchase or use the article, no matter how alluring its name or fine its appearance, without ascertaining its purity by careful testing.

Adulterated and Artificial Honey.—A large share of the strained honey in market is adulterated with glucose, as well as are sirups. In some cases, so-called honey contains not a particle of the genuine article, being simply a flavored sirup of glucose. We have examined specimens in which considerable quantities of sulphuric acid were present.

Unscrupulous men are in different parts of the country engaged in the manufacture of artificial honey from cane-sugar and various flavoring ingredients. We were informed by a gentleman not long since that in a Western State he had encountered a man who was traveling through the country selling a recipe for making artificial honey. When solicited to purchase, he very properly responded that he had nothing whatever to do with frauds of any kind.

It is stated that another very ingenious form of adulteration of honey has been quite extensively practiced. What is termed the foundation of the comb is made of paraffine, a wax-like substance made from petroleum. This saves the bees much labor, as they have but to build up the cells on the foundation furnished them. Then, to still further economize their time and labor, they are abundantly supplied with glucose in solution, which they have but to transfer to the comb, thus avoiding the trouble of gathering sweets from distant fields. Of course no transformation takes place in the artificial sugar, it being simply transferred from the feeding vessel to the comb. Thus we have honey which is wholly artificial with the exception of a portion of the wax. This certainly caps the climax of adulterations.

The tests for artificial and adulterated honey are the same as those for glucose in sirups.

Candy.—Of all mixtures put into the stomach, probably candy is nearly, if not quite, the most thoroughly adulterated. With the exception of rock candy, which is pure crystallized cane-sugar, there is probably no variety of candy which is not adulterated more or less. Very little cane-sugar is employed in its manufacture, it being chiefly composed of glucose. Considerable quantities of gypsum and terra alba are also used, especially in the cheaper grades. The flavoring substances employed are all artificial and unwholesome, often poisonous. But the most deleterious adulterant used is found in the colors with which candies are made attractive to unsophisticated eyes. No less than twenty-four different coloring substances, mostly mineral, are employed, all of which are rank poisons. Numerous cases have occurred in which poisoning has been traced directly to colored candies, and in some instances death has occurred.

We need not give directions for the detection of adulteration in candies, for all are bad, and should never be allowed to enter a human stomach. Children especially, should of all persons be forbidden these poisonous dainties. They would be harmful enough to warrant their

disuse if they were wholly pure; but as it is, they are absolutely dangerous; and the manufacturers should be dealt with as foes to the public health.

Adulteration of Baking-Powders.—The competition in trade and the cupidity of manufacturers, as might reasonably be expected in these days of wholesale and almost universal sophistication, has led to the wholesale adulteration of this widely used commodity. Some time since, Henry A. Mott, Ph. D., government chemist, made an extensive series of analyses of baking-powders, and published the results, which showed that many of the most popular brands were largely adulterated with alum, the deleterious effects of which were well known. There was a great disturbance at once among the manufacturers of baking-powders, and it was not long before the attempt was made to convince the public that alum when used in this manner is in no way detrimental to health, it being claimed that the chemical reactions which take place when it is used in raising bread are such as to convert it into a different and wholly harmless substance. In order to answer these specious arguments conclusively and satisfactorily, Dr. Mott undertook an extended series of experiments with alum baking-powders upon animals. He selected healthy dogs and fed them upon biscuit made with the baking-powder. In every case the dogs became sick, some within a few hours, and others after a day or two. As a general rule they would scarcely touch the biscuit after the first day, preferring starvation to poisoned food. The principal symptoms arising from the use of the alum baking-powder were sickness, violent vomiting, loss of energy, and weakness of the limbs. The effects upon human beings have been shown to be, "headache, indigestion, flatulence, constipation, diarrhea, dysentery, palpitation, and urinary calculi." Its effects upon young children are especially disastrous, causing a great increase of mortality through the production of diarrhea. Among the numerous names of distinguished physicians who protest against the adulteration in question may be mentioned Dr. Willard Parker.

Dr. Mott's experiments showed that alum interferes with digestion by rendering the gastric juice incapable of digesting food, and also causes congestion and inflammation of the mucous membrane of the stomach and bowels. By making an analysis of the internal organs of several dogs killed after being fed on biscuit made with alum powders for several days, he was able to detect it in considerable

quantities in the stomach, spleen, liver, heart, and other viscera, and also in the blood.

Baking-powders are preferable to soda, saleratus, cream of tartar, and sour milk, in the way these substances are commonly used, and yet they can be avoided, and with benefit to the health. The alum powders are the worst of all compounds used for raising bread. They should never be employed. The presence of alum in baking-powders may be detected by testing for alum the bread made from it, as already directed.

Cheese.—Like butter, cheese is now much adulterated by the oleomargarine process. Much of it is made of skim-milk to which tallow has been added to replace the cream removed. There is no means by which the fraud can be detected. Cheese is often colored with annatto, by which it is frequently rendered poisonous from adulteration of the coloring matter with red lead and salts of copper. Persons have been seriously poisoned by eating cheese rendered unwholesome in this way. The rind of cheese is often extremely poisonous, in consequence of having been washed with a solution of corrosive sublimate to prevent the attacks of insects. Mercury has frequently been found in the rind of cheese.

Canned Fruits and Vegetables.—Canned fruits and vegetables are often adulterated with coloring and flavoring substances of an unwholesome character. The most common are red coloring matters in tomatoes (not very common in this country), fuchsine and aniline in fruits, and salts of copper in peas and other green vegetables. It occasionally happens, also, that the solder with which the cans are closed causes contamination of fruits with lead. Sometimes the cans themselves are a still greater source of danger, being made of lead-tin.

Within the last few years a recipe for preserving fruits has been widely sold which consists in exposing the fruit to the fumes of burning sulphur, or immersing it in water which had become impregnated with sulphurous acid by such exposure. The deleterious influence of such a preservative is well shown by the fact that it destroys the color of fruit exposed to its action, and deprives it of its finest aromatic flavors. It should never be employed. The plan is not a new one, though presented as such. It has been well known for many years, perhaps centuries. Salicylic acid has been suggested as a preservative; but the quantities in which it would need to be used would render articles preserved with it unwholesome as food.

When the coloring matter is of an earthy character, some portions may be found in the bottom of the can as sediment. When fuchsine or aniline is present, it may be detected by placing in the juice of the fruit, as found in the can, a few threads of white woolen yarn or worsted. After half an hour remove the threads, and if the coloring matters mentioned are present they will be colored red, as will not be the case if only the fruit juices are present.

Adulteration with copper may be strongly suspected if such vegetables as peas have a bright green appearance. The presence of copper will be proven if a bright strip of iron or a sewing-needle placed in the can over night, after adding a few drops of sulphuric acid, is found to be coated with a coppery-colored film in the morning. A very small proportion of copper may be detected in this way.

Preserves, Marmalade, etc.—A large share of the preserves manufactured for the retail trade are adulterated more or less in one way or another. It is customary to make into preserves inferior fruit, or that which has spoiled by too long keeping, or is otherwise unfit for sale. In many cases, preserves are colored with fuchsine and aniline, as are some canned fruits. Marmalade often consists chiefly of apples flavored with orange essence. Copper is also sometimes found, as in canned fruits. It is usually accidental, however, its presence being due to the fact that preserves are generally made in copper kettles, some of the copper being dissolved by the juices of the fruits, the solution of the copper being facilitated by the heat and the stirring. On this account, preserves should never be made in copper kettles. "Marbleized iron-ware" should also be avoided, as it is dangerous on account of the presence of lead in the enamel.

Jellies.—It is rare to find in the market such a thing as pure fruit jelly. If found, it will be held at a high price. The ordinary jellies sold are largely made up of gelatine, colored with aniline and other dye-stuffs, and flavored with various essences. Many of them contain not a particle of the fruit after which they are named. A less harmful but no less fraudulent form of adulteration is the use of apple jelly, flavored to suit the different varieties for which it is sold. The coloring matters may be detected by the method already described; but as so few are pure, it is best to avoid them altogether.

Fruit Extracts.—The science of chemistry has lent its aid to the art of adulteration so effectually that almost, if not quite, every one of

the principal fruit flavors is so closely imitated by chemical compounds that the difference cannot be detected by the taste, though, undoubtedly, the difference is readily noticed by the stomach. The following description of the composition of some of the principal flavoring extracts we condense from a report on the subject in the Annual Report of the Massachusetts Board of Health for 1873:—

Pine-apple essence is a solution in alcohol of butyric ether, which is made by distilling butyric acid with alcohol and oil of vitriol. The butyric acid is made from decayed cheese.

Quince essence is a solution in alcohol of an ether obtained by treating oil of rue with aqua fortis, and digesting with alcohol the acid thus obtained.

Pear essence is made by distilling a mixture composed of fusel-oil, acetate of potash, and strong sulphuric acid, or oil of vitriol, and mixing the product with alcohol.

Apple essence is made from sulphuric acid, fusel-oil, and valerianic acid.

The flavor of currants, bananas, raspberries, strawberries, etc., is imitated by mixing the various ethers known to chemistry, and combining with them camphor, acetic acid, vanilla, and the various essential oils.

Not only are these essences sold at retail for domestic use, but they are largely, in fact almost exclusively, used by bakers and confectioners. Pastry, jellies, and ices are made still more atrocious by the addition of these abominable mixtures. Serious illness and even death has frequently been caused by the use of articles containing the poisonous substances above mentioned.

A perusal of the above will be sufficient to satisfy any one that the so-called fruit essences are not suitable substances to be mingled with food. Sirups flavored with these essences are usually employed in the preparation of soda-water, a fact which certainly makes the use of this popular summer beverage exceedingly questionable. Candies also are flavored with the same vile compounds, together with jellies, as before mentioned.

Canned and Potted Meats.—Canned fish and other meats are often in a condition unfit for food when put up, and are further deteriorated by a peculiar kind of decomposition which it is scarcely possible to discover by examination, but which often produces most serious consequences when the meat is eaten. This condition of the

contents of a can may be best determined before the can is opened by observing whether the end bulges outward or is drawn in. If there is bulging, the meat is bad. Potted meats are often colored for the purpose of hiding dirt, or to give the cooked meat a more lively appearance. All such meats are particularly unwholesome.

It has been discovered, through the testimony of a manufacturer, that large quantities of horses' tongues and flanks are worked up into potted meats as beef.

It has been known for a long time that sausages are often adulterated with horse-flesh, as well as that of dogs and other animals. A year or two ago the discovery was made in San Francisco that a prominent sausage-maker of that city was in the habit of working into his sausages large quantities of cat-flesh. This fact was discovered by the large number of cats which he was known to receive daily, and was acknowledged by him in court. We can hardly regard these additions as making the article any worse than it was originally, since we can imagine no animal whose flesh would be likely to be more unwholesome than that of the swine.

Vinegar and Pickles.--Vinegar is very often adulterated with mineral acids, sulphuric acid being the most commonly used. Many specimens of vinegar offered for sale as cider vinegar have not a drop of apple juice in them. Vinegar is itself an unwholesome article; but it becomes tenfold more injurious when adulterated with strong acids, injuring not only the stomach but the teeth. The presence of sulphuric acid, or oil of vitriol, may be detected by the test given for this acid in sirups. It is said that it may also be detected in the following manner: Add to the vinegar a small quantity of sugar. Then put a drop or two on a clean plate and evaporate at a low heat. If the acid is present, the spot will become black, through its action on the sugar.

The following is a recently devised, and probably the best, test for mineral acids in vinegar: Pour into a test-tube or small vial two to four teaspoonfuls of the vinegar to be tested. Add twenty or thirty drops of a strong solution of salicylate of soda. If mineral acids are present, the salicylic acid will be separated from the soda and will appear in the form of curds. The salicylate of soda may be obtained at any drug-store. A dram will be sufficient to test several samples of vinegar. The chloride-of-barium test may also be used.

Pickles are of course liable to contamination with the same acid to be found in vinegar, and in addition are subject to a very dangerous form of adulteration, the addition of some salt of copper to deepen the color. Very green pickles are sure to have more or less copper in their composition. The copper is sometimes added, perhaps more often derived from the copper kettle in which the pickles are made, through the action of the acid of the vinegar upon the copper. It is customary to make pickles in brass kettles for the purpose of giving them a green color. Some cook-books even recommend that a few copper pennies be boiled in the kettle with the pickles for the purpose of "greening" them. The practice is not only a most absurd one, since it in no way adds to the flavor of the pickles, but is very dangerous. Pickles are unwholesome and indigestible at the best; and when poisoned in this manner they become about the worst articles which can be put into the stomach. Copper and brass kettles should never be used in any way in connection with cookery.

The presence of copper in pickles may be easily detected by putting a clean bright iron wire for a few hours into the bottle containing them. If copper is present, it will appear as a thin film upon the wire.

Lemon and Lime Juice.—These valuable acids, sometimes preserved in the form of the juices of the fruits from which they are obtained, are not infrequently adulterated with sulphuric acid, which is intensely sour, and is also an active chemical poison. Sulphuric acid is not infrequently used by those who sell cheap lemonade at stands in the cities, as it is a much cheaper acid than lemon. We have known of instances in which serious poisoning has occurred from drinking this kind of lemonade which had been made in a zinc water-cooler, the poisoning being occasioned by the zinc. Test with chloride of barium. "Salts of lemon" sold in the market is a dangerous poison consisting of oxa · acid.

Tea and Coffe. —These substances, used as beverages in infusion, are largely adulterated, though in the case of coffee the adulterants employed are not worse than the original substance. Tea is, however, rendered even more unwholesome than it naturally is, by the addition to it of Prussian blue and various other harmful substances. It is a fact worth remarking, that Chinamen in this country will not drink the tea which is imported from their country for American consumers,

alleging, when questioned, that it is impure, they being evidently aware of the general practice of adulteration for foreign exportation.

The chief adulterants of tea are the leaves of other plants—as of the sycamore, horse-chestnut, plum, beech, plane, elm, poplar, willow, oak, hawthorn—exhausted tea leaves, lie tea, sand, quartz, oxide of iron, iron filings, starch, black-lead, gum, indigo, Prussian blue, turmeric, Chinese yellow, China clay, soapstone, French chalk, mica, gypsum, rose pink, Dutch pink, chrome yellow, Venetian red, carbonate of copper, arsenite of copper (Paris green), bichromate of potash, carbonates of lime and magnesia, copperas, catechu, etc.

The detection of the leaves of other plants is comparatively easy. The tea should be soaked in warm water for an hour or two, when they can be unrolled and spread out upon a pane of glass and compared with the genuine leaves shown on PLATE XI, on which, and on PLATE XII, are shown some of the more common leaves employed in the adulteration of tea. Leaves that have been once used, and treated with gum to give them the appearance of the genuine, may be detected by their unnaturally glossy appearance. The roll is also less regular than that of unused tea.

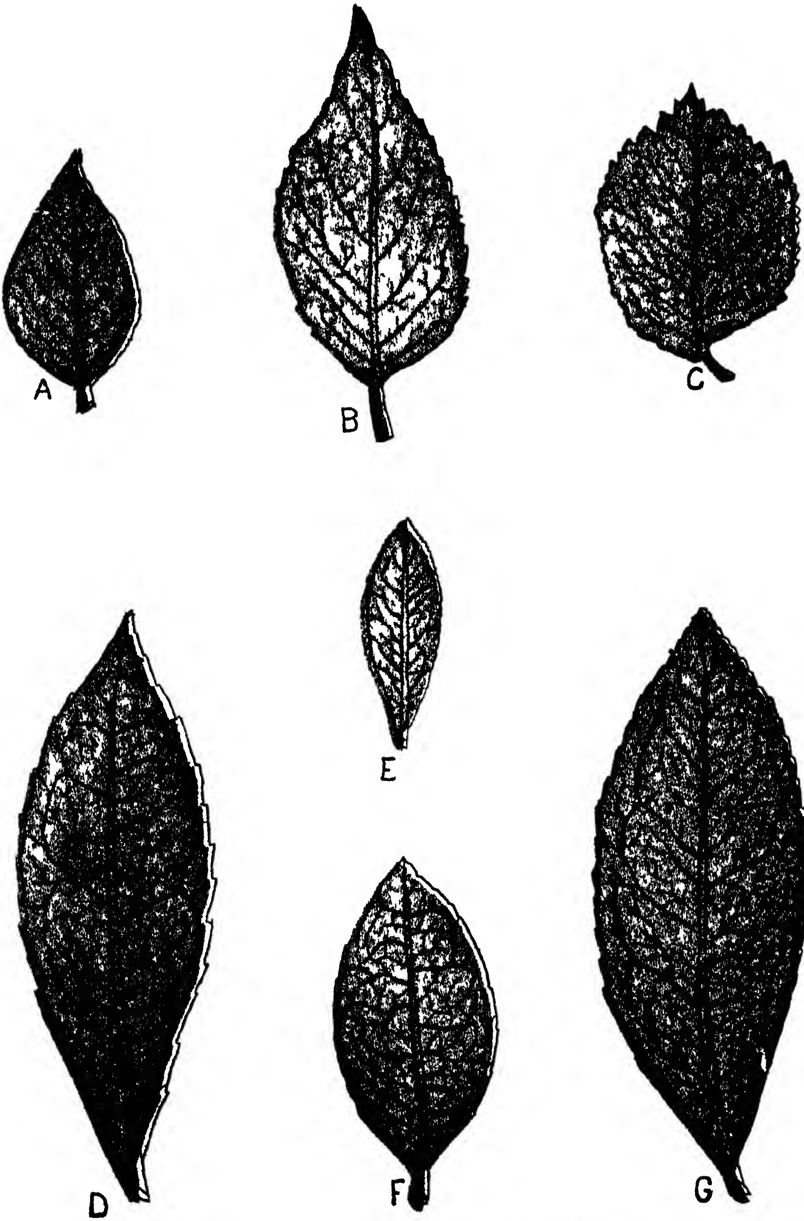
Lie tea is composed of fragments of tea leaves, exhausted leaves, dirt, coloring matter, etc., held together by boiled starch. The fraud may be easily detected by soaking the sample a few minutes in boiling water. The small masses, instead of unrolling, as in genuine tea, dissolve into small, dirty particles.

Iron oxide and iron filings may be easily detected by means of a magnet. When a magnet is plunged into the tea, small particles adhere to it. By repeating the process, removing the adhering particles each time, all the iron may be removed from the tea.

Prussian blue, indigo, black-lead, gypsum, turmeric, and various other substances used as facing, may be easily detected by either one of the following methods:—

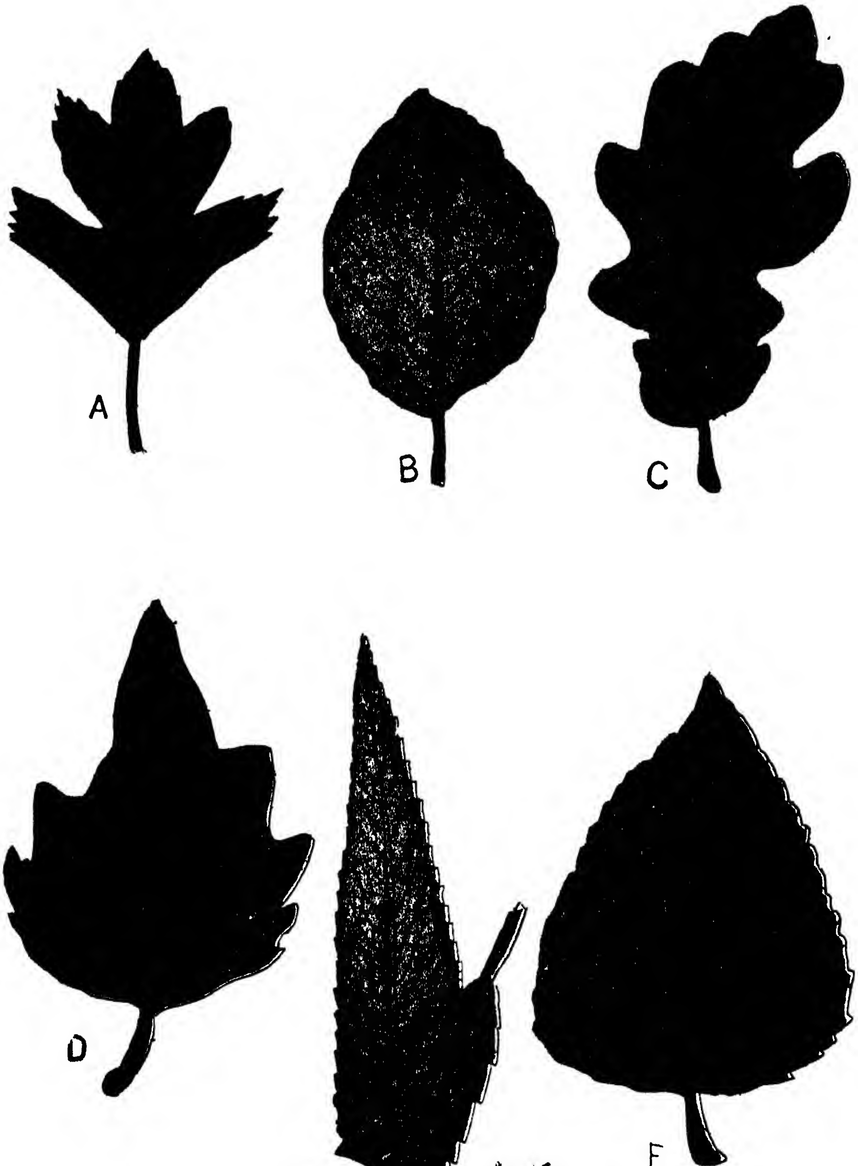
Place two or three ounces of the tea in a piece of thin muslin and shake well over a piece of white paper. Examine the dust thus collected with a magnifying glass, capable of enlarging ten or fifteen diameters. An ordinary botanizing glass answers the purpose admirably. Prussian blue appears as brilliantly blue, transparent, angular particles. Indigo particles are greenish blue and opaque.

Another method is to wash a few ounces of tea with cold water, placing the washings in a glass to settle. Examine the sediment in the manner directed.



A. Wild Plum; *B.* Elder; *C.* Elm, *D.* Tea leaf; *E.* Young leaf; F. Leaf partly grown, *G* Tea leaf of green variety.

PLATE XI.—*GENUINE LEAVES OF TEA AND LEAVES USED IN ITS ADULTERATION*



A. **Hawthorn;** *B*; **Beech;** *C.* **Oak;** *D.* **Plane;** *E.* **Willow;** *F.* **Poplar.**

PLATE XII.—*LEAVES USED IN ADULTERATION OF TEA.*

Black-lead, turmeric, mica, sand, and most other adulterants, may also be detected by examining the dust or sediment with a magnifying glass. The presence of gypsum is shown as follows: Add to some of the sediment, in a test-tube, a few drops of muriatic acid; add a little water, and then a few drops of a solution of chloride of barium. If a white precipitate appears, it is evidence that the tea has been adulterated with sulphate of lime.

Adulteration of Coffee, and Modes of Detection.—The most extensively used adulterant of coffee is chicory, a fleshy root. This is found not only in ground coffee, but in coffee berries, the chicory being molded into the form of coffee berries by means of machinery for the purpose. Chicory is not a poisonous substance, and is wholly devoid of narcotic or stimulating properties. Ground coffee is universally adulterated, not one specimen in ten, according to most reliable authorities, containing a particle of genuine coffee. Peas, beans, acorns, wheat, rye, barley, bran, carrots, parsnips, chefus-nut, almond shells, sawdust, oak bark, exhausted tan bark, and many similar substances, are used in adulterating coffee, being roasted and ground, and sold in packages. Burnt sugar and molasses are used to flavor and color these various substances. Venetian red is also used for coloring. Essence of coffee consists almost wholly of burnt molasses.

Date stones have recently been employed in the adulteration of coffee in large quantities, and, according to Hassall, this beverage, so much prized by millions of the human race, is in some parts of England and the East adulterated with the livers of horses and cattle, which are roasted and ground for the purpose.

Nearly all the substances used in the adulteration of coffee may be detected by means of the microscope. The following simple means are also usually sufficient to determine the character of any specimen of coffee:—

1. Notice if the ground coffee cakes in the paper or package containing it or when pressed between the fingers. If it does, it is spurious.

2. Place a few pinches upon water in a goblet. If part floats while another portion sinks, it is adulterated. Pure coffee absorbs water slowly and so floats for some time, while the substances used to adulterate it absorb water quickly and sink. The amount of adulteration can be readily estimated by observing what proportion sinks readily.

3. Moisten a few grains of the coffee spread out on a piece of glass. If small particles can be picked out which are so soft that they can be easily mashed between the fingers, the coffee is adulterated.

4. If water into which ground coffee is placed quickly becomes deeply colored, the sample is adulterated, since pure coffee colors water slowly.

Cayenne Pepper.—Though not an article of food, and an unwholesome condiment, cayenne is the subject of a dangerous form of adulteration. In order to add weight, ground rice, and other substances, are employed; and then to produce the required intensity of color, red lead and vermilion or bi-sulphuret of mercury, both very poisonous substances, are used. We mention this fact as an additional inducement for abstaining from the use of cayenne as well as other condiments.

Artificial Cider.—In the West, large quantities of a mixture called cider are made by compounding sugar, tartaric acid, and yeast, and allowing fermentation to take place. It is a harmful beverage.

Adulteration of Tin.—On account of the increased cheapness and convenience of manufacture, a large share of the tin plate made at the present time contains in it a large proportion of lead. As tin vessels are much used in cooking and other processes connected with food, this is a matter of very serious importance. Numerous examinations by eminent chemists have shown that milk pans, basins, dippers, cooking utensils, etc., are nearly all rendered dangerous by this means. The lead of tin-lined milk pans will not be affected to a sufficient extent to do any harm until the milk sours, when the lead is rapidly taken up by the acids formed. Acid fruits of any kind, and even sweet fruits, sirups, and preserves, when cooked or allowed to stand for any length of time, may become contaminated with lead, and produce lead poisoning. Tomatoes, vegetables, and various fruits put up in tin cans, may become contaminated in this way. This kind of tin may be detected by a simple test which any one can apply. Place upon the metal a drop of nitric acid, spreading it to the size of a dime. Dry over a gentle heat, apply a drop of water, and then add a small crystal of iodide of potash. If lead is present, a yellow color will make its appearance very quickly after the addition of the crystal of iodide of potash.

The cheaper grades of tin are, almost without exception, adulterated in this way. On this account, we should by all means dis-

courage the use of tin cans for canning either fruit or vegetables, the danger of contamination being so great. For those who put up their own fruit, glass cans are fully as cheap, as they can be used many times instead of but once.

Poisoning from Fruit-Jars.—Another danger to which attention has been called very recently is from the use of glass fruit-cans with zinc covers. Only those having glass or porcelain-lined tops should be employed. The danger of using those with zinc covers is shown by the following account of a case of poisoning which we quote from a prominent sanitary journal:—

"Four persons were poisoned recently in Brooklyn from eating canned cherries. Fortunately they all recovered by prompt treatment. Prof. Geo. W. Plympton made an analysis of the fruit left, and found the poison to be a salt of zinc formed by the action of the acid in the cherries on the zinc cover of the jar. The preserving had been done with scrupulous care, the jars were of a kind in common use, and the contents of several had been eaten without any unpleasant effects. On examining some which had not been before opened, one having a zinc top with a porcelain lining was selected, and in it there was no indication of zinc. But on pouring a portion of the sirup of this jar into the zinc cover of the first, and warming it over a water-bath for three-quarters of an hour, the solution promptly yielded to the test for zinc. . . . The case is not without parallel, and the public should learn that the use of zinc or galvanized iron in the preservation of fruit or vegetables is not free from danger."

Lead Glazing.—Within the last few years there has appeared a kind of glazed ironware which is in the highest degree unsafe on account of the amount of lead and even arsenic contained in the glazing. The quantity is so great that acid fruits would readily become affected. Crockery is also sometimes glazed with lead, making it dangerous to use except for dry substances. This ware may be tested in a manner similar to that suggested for lead-adulterated tin. Only the "marbleized ironware" is adulterated. "Granite-ware" is safe.

Accidental Poisoning of Water with Lead.—By means of lead employed as water-pipes, tanks, eave-troughs, roofs, cistern covers, etc., water may be so charged with mineral poison as to become highly dangerous to health. Many cases of lead paralysis have been caused by taking lead in some unsuspected manner, such as has been mentioned. Hence it is very important that the public

should be told to be on the lookout for danger from this source. Lead is not a suitable material for the conveyance or storage of water, and should never be so employed. When obliged to drink or use for culinary purposes, water which runs through lead or zinc pipes, it should be allowed to run some little time before being used, in order that that which has been long in the pipe may be exchanged for that which is pure. Only pure tin should be used for roofing, eave-troughs, leaders, etc., when the water collected is to be used for drinking or cooking purposes. Wood and iron are much to be preferred to lead or lead-tin as a material to be used for such purposes. In cases in which tin containing lead has been used for roofing purposes, the difficulty may be remedied by covering the roof with a mixture of coal-tar and water-lime cement, in the proportion of one part of lime-water to three of coal-tar. Roofing tin is so rarely pure that it may be considered as being always contaminated with lead. Hence the importance of attending to the last suggestion made.

Salicylic Acid.—This drug, either as an acid or in combination as salicylate of soda, is much used as a means of preserving cider, bottled fruits, and other foods. Recipes for the preservation of food generally consist of this substance in combination with some other indifferent substance employed to conceal it. While small doses of salycilic acid are not directly injurious, the long continued use of this drug, even in small quantities, must result in injury. The French government has prohibited the sale of foods containing this substance. A similar law should be enforced in this country.

WATER:

ITS HYGIENIC USES, AND DANGERS FROM ITS USE WHEN IMPURE.

The Hygienic Value of Water.—If we except pure air, it may safely be said that no other element in nature sustains so important relations to the living system as does pure water. An individual will live much longer on water alone than if deprived of drink. Water constitutes a large proportion of all our food, varying, in grains and vegetables, from fifteen to more than ninety per cent. If the water thus contained in solid food were wholly removed, an individual would doubtless be enabled to subsist longer on water only than on solid food so treated. Though water undergoes no change in the body, and hence takes no part in the development of force, it is absolutely essential to the performance of the vital functions, being necessary to enable the various organs to perform their offices in the maintenance of the vital activities.

The circulatory system is especially dependent upon this element. Water is the menstruum which floats the blood corpuscles and the varied nutritive and excrementitious elements which form the blood. By its aid, the nutrient particles destined to enter into the structure of the body are conveyed to the most minute and remote fibre of the intricate human mechanism where repair or growth is demanded. No other element in nature is so well suited to this exact purpose as water. It is so limpid and mobile that it can circulate through the most delicate capillaries, and can even find its way, by osmosis, into parts inaccessible by openings.

Thirst.—Water is continually passing away from the body. The dry air entering the lungs by respiration absorbs it from the moist surface of the pulmonary membranes. A large portion is lost by evaporation from the skin, upon which it is poured out by millions of little sewers, the perspiratory ducts, for the purpose of washing away impurities from the system. The kidneys remove a considerable quantity, with poisonous excrementitious elements in solution.

Through still other channels water is removed, aggregating, in all, the amount of five pints in twenty-four hours in the average individual. This loss must be made good, in order to preserve the requisite fluidity of the blood; and nature expresses the demand for water by thirst.

Some people rarely drink liquid of any kind. Others consume several pints in a day. The nature of an individual's occupation will in a measure determine the amount of drink required. Stokers, glass-blowers, and others whose vocation necessitates profuse perspiration, require more water than others. It will be noticed, moreover, that the character of the diet has much to do with the demand for drink. Those who subsist mostly upon fruits and grains, and other vegetable productions, avoiding the use of stimulating and irritating condiments, require little or no addition to the juices contained in their food. Those who pursue an opposite course in dietetics, using largely animal food, salt, pepper, spices, and other condiments, and perhaps drinking a little wine or something stronger, are under the necessity of taking considerable quantities of fluid in addition to that provided by their food.

Water is the only substance which will quench thirst. Beverages which contain other substances are useful as drinks just in proportion to the amount of water which they contain, and are unwholesome just in proportion as the added elements are injurious.

Regulation of Temperature.—The evaporation of water from the surface of the human body is one of the most admirable adaptations of means to ends exhibited in animal life. All of the vital activities in constant operation in the body occasion the production of heat. Sometimes the amount of heat is greater than is needed, and so great as would destroy the vitality of certain tissues if it were not speedily conducted away. By evaporation of water from the skin, this is accomplished. When external heat is great, perspiration is more active than when it is less, and thus the temperature of the body is maintained at about 100° F. under all circumstances. By this wonderful provision of nature, man is enabled to exist under the great extremes of heat and cold presented in the frigid regions at the poles and the torrid climate of the equator. By the aid of clothing, human beings have survived a continued temperature of 60° to 100° below zero; and, by the protective influence of evaporation, an average of 100° above zero has been endured in tropical climes. For short periods, so great a degree of heat as 350° F., or even 600°, has been borne

with impunity in exceptional instances. In these cases the extreme heat which would otherwise reduce the body to a cinder in a few moments is rapidly conducted away by evaporation without occasioning any damage.

Depuration.—Every thought, every movement, the most delicate vital action, occasions the destruction of a portion of the living tissues, which is thus converted into dead matter, and becomes poisonous. Many kinds of poisonous substances are produced within the body in this way. Some of them are very deadly, and must be hurried out of the system with great rapidity, as urea and cholesterine. Here the marvelous utility of water is again displayed. It dissolves these poisons wherever it comes in contact with them, and then as it is brought by the current of the circulation to the proper organs—the kidneys, liver, skin, lungs, and other emunctories—it is expelled from the body, still holding in solution the animal poisons which are so rapidly fatal if retained.

Prof. Liebig and others have shown that the free drinking of water greatly favors the elimination from the system of the products of waste in the system. It not only increases the quantity of fluid eliminated by the skin, the kidneys, and the liver, but also the amount of solid matter. The free use of water also hastens tissue change, thus enabling a person by this means to rapidly change or renovate his tissues when such a change is desirable. Experiments have shown, further, that the free use of pure water as a drink encourages assimilation. It is well known that it is conducive to fatness. Thus it appears that water is the chief of all alterative remedies which can be administered internally.

It may be further mentioned that water is useful as an aid to digestion in dissolving the elements of food. It is also of very great value as a means of applying heat to or abstracting it from the body for remedial purposes, as well as for cleansing purposes, being the universal detergent.

The following table gives a correct idea of the relative importance of water as an element of the body, according to the results obtained by the best observers:—

PROPORTION OF WATER IN 1000 PARTS.

The entire body,	700
Teeth,	100
Bones,	130
Cartilage,	550
Muscles,	750
Ligaments,	768
Brain,	789
Blood,	795
Synovial fluid,	805
Bile,	880
Milk,	887
Pancreatic juice,	900
Urine,	936
Lymph,	960
Gastric juice,	975
Perspiration,	986
Saliva,	995

The proportion of water found in the most common articles of food may be seen by reference to the table (page 370) giving the constituents of various food substances.

Composition of Water.—Chemically considered, water is made up of two gases, *oxygen* and *hydrogen*, in the proportion of one volume of the first to two of the second, and by weight, of eight parts of the first to one of the second, as oxygen is sixteen times as heavy as hydrogen in equal volumes. Water contains in addition, in solution, a certain proportion of atmospheric air, unless the air has been removed by some artificial process, or unless the water has been recently produced by distillation. It is this dissolved air which supports the life of fish and other marine animals. A fish will die as quickly in water which has been boiled as if removed from the water entirely.

Pure Water.—Chemically pure water is not found in nature. All natural water, whether taken from springs, wells, lakes, streams, dug wells, deep artesian wells, or caught as it descends from the clouds, contains a larger or smaller proportion of impurities. As a general thing, rain-water contains fewest impurities when it is freshly collected upon clean surfaces. Its character depends, however, in a very great degree upon the locality where it is obtained, and the manner in which it is collected. In and near large

cities, rain-water is always considerably colored and contaminated with smoke, dust, animalcules, portions of hair, etc. In the country, remote from populous districts, a much greater degree of purity is obtainable. The character of water obtained from lakes, streams, springs, or wells, in a large measure depends upon the character of the soil through which it passes, as nearly all substances found in the earth, even the hardest rocks, are in some degree soluble, so that water passing through the soil and various strata near the surface, dissolves and holds in solution a great variety of mineral elements. The chief of these are compounds of lime and magnesia.

Hard Water.—Water is said to be hard when it will not produce a good lather with soap, but forms curds instead. Hardness is due to the presence of earthy salts in the water; salts of lime—chalk and gypsum—are the most common. Twenty grains per gallon of any of these salts is sufficient to render water hard and unfit for use, though some waters furnished to cities for general use contain from 70 to 160 grains per gallon of solid matter. Hard water is unfit for cleansing purposes because its mineral ingredients form insoluble compounds with fatty substances. When mixed with soap, the lime or other mineral takes the place of the soda or potash in the soap, and forms an insoluble curd, instead of a lather. When a large quantity of soap is added, a lather can be formed, as the minerals in solution are neutralized by the extra amount of soap. Water which contains a pound of lime, or its equivalent of other minerals, in ten thousand gallons, is said to be of one degree of hardness; that having two pounds of lime in the same quantity of water, two degrees of hardness, etc.

Is Hard Water Wholesome?—This question has been much discussed by sanitarians and physiologists. Some have claimed that hard water is much more wholesome than soft, and even very important for the preservation of health and to secure proper physical development, while others have taken the opposite ground. The following are the principal arguments which have been urged in defense of hard water:—

1. Nature provides hard water, and hence it must be more natural to employ it than to use soft water artificially purified.

2. The body needs some of the salts held in solution by hard water, and is consequently deprived of them when soft water is used.

3. People who use hard water are more healthy than those who employ soft.

4. Hard water is less liable to become poisoned by passing through lead pipe.

The first objection disappears when we consider the fact that with man drinking is a practice which is largely the result of other unnatural habits and forced conditions. Comparative anatomy clearly proves that man is naturally frugivorous in dietetic character, his natural diet being mostly fruits, with a few of the most easily masticated grains. This being the case, it is evident that so far as the provisions or intentions of nature are concerned, the evident design was that man should obtain all the watery elements he requires from the juices of succulent fruits. That this may be done without inconvenience or failure of perfect nutrition, has been again and again demonstrated by actual experiment. Indeed, persons who have discarded from their dietary, salt, pepper, spice, and all irritating substances of like nature, often find that they have no necessity whatever for drinking, and that weeks and months pass without the thought of drinking.

In regard to the second objection, we may say that there is no evidence that water was ever intended as a medium for conveying to the body those elements of a mineral character which are thought to be necessary to the proper maintenance of the body. And, furthermore, there is no satisfactory evidence that the system can ever appropriate as nourishment any kind of mineral matter, either in solution or any other form; but there are many facts which indicate very conclusively that the human system can only assimilate such substances as have been organized by the action of vegetable life and growth. On this point, an eminent surgeon, lecturing before his class in a celebrated Western medical college, remarked, "The administration of mineral salts in the form of solution will occasion an increase of their quantity in the excretions of the body, but will not remedy any deficiency of this kind of material which may be supposed to exist in any portion of the system."

Again, the mineral matter found in hard water is of a character which would render it of little value to the system were it capable of assimilation,—judging from analysis of the bones,—since the principal constituent of bony tissue is phosphate of lime, while the chief ingredient of hard water is carbonate of lime, a substance which is found in the bones only in small quantity, and which may be by no means essential.

Nothing could be more uncandid and deceptive than the manner in which the statistics have been collected which seem to show that hard

water is more conducive to health than soft water. The varying conditions of the inhabitants of the districts compared, as relates to other circumstances which affect health, have been entirely ignored. Thus, the claim for the superior character of hard water is made when it is found that the inhabitants of elevated mountainous districts, where the advantages of a pure and invigorating atmosphere, together with constant and vigorous exercise, are ever present, are more healthy, notwithstanding the use of hard water, than those who use soft water, living in low, malarious districts, or situations otherwise unfavorable to health. Or, again, a similar comparison is made between those who use hard spring water, free from organic impurities—as decaying vegetable and animal matter—and those who are compelled to use soft water which is filled with the many poisonous substances and compounds resulting from the decomposition of organic substances. Thus, it is found that the inhabitants of London, who use the imperfectly filtered water of the Thames River, into which is poured all the filth and offal of that great city, are much less healthful than the sturdy Highlanders of Scotland, who use hard water as it bubbles cool and pure from the springs of their native mountains.

The fourth objection is hardly worthy of notice, though not infrequently urged. It is true that hard water, in passing through lead pipes, after a time deposits a coating of lime upon the interior, thus protecting the water from contamination by the lead; but this advantage is by no means sufficient to render it advisable to adopt the use of hard water, since poisoning from lead pipes may be still more effectually prevented by a lining of glass, as is now done.

The evils resulting from the use of hard water are numerous, and many of them exceedingly painful. Some of the most common are torpid liver, and biliary, renal, and urinary calculi.

The best advice we can give those who cannot obtain from wells, water which is nearly soft, is that they should by all means resort to the use of rain-water, cleansing it from impurities by boiling and filtering. A home-made filter may be easily constructed. See pp. 445–448.

The idea that the lime, magnesia, iron, and other minerals found in water are beneficial to the human system is as absurd as that the carbonic acid, ammonia, sulphureted hydrogen, and other noxious gases, poisonous germs, etc., found in the atmosphere, are necessary for the maintenance of animal life.

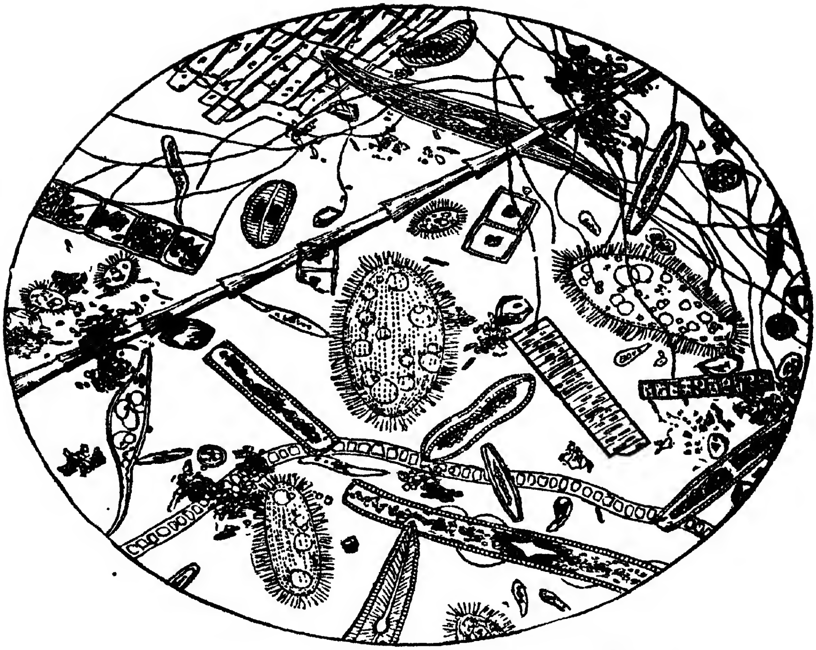
A final and conclusive argument which shows the utter weakness of

the reasoning in favor of hard water is that the amount of "salts" considered so important, which would ordinarily be received through the use of hard water, even if it should be appropriated, of the possibility of which there is good reason to doubt, would be so inconsiderable, compared with the amount received through other and better means, as to be utterly insignificant. For example, hard water which is considered suitable for use, even by those who advocate hard water, is not often of more than twenty-four or five degrees of hardness. This would supply about sixteen grains of salts per gallon of water. Few people take more than two and one-half pints of water a day in the form of drinks, which would afford only five or six grains of "salts," and that in an inorganic state. More than double this quantity would be supplied by an ounce of oatmeal, a half-ounce of meat, an ounce of peas or beans, or a gill of milk. When we consider that the average amount of food taken daily supplies the system with from thirty to one hundred times as much mineral matter as would be received in drinking hard water, the argument that hard water is necessary to supply mineral elements to the system becomes ridiculously absurd.

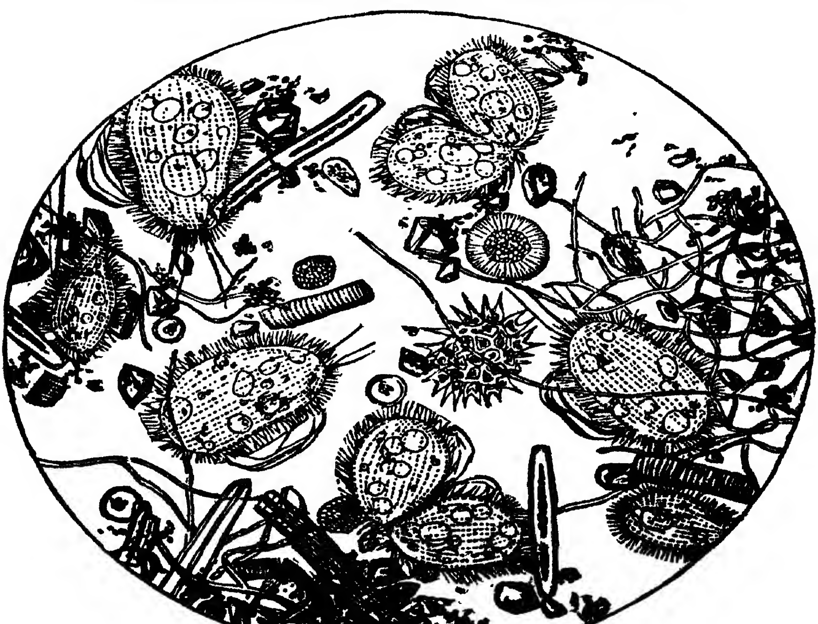
No directions are needed for the detection of hard water, as every one is familiar with its effect upon soap. Undoubtedly many will be pleased, however, to learn how —

To Soften Hard Water.—Very hard water is objectionable, not only on account of its injury to health, but on account of the great inconvenience and expense which it involves through the waste of soap and the increased labor in using it for washing. There are several means of rendering water soft, or nearly so, based upon the fact that lime and magnesia are very insoluble in water unless it contains an excess of carbonic acid. Hard water may be softened by adding soap until the lime and magnesia are neutralized, and then as much more as is needed for washing; but this is an expensive and troublesome mode. A better way is boiling for half an hour. This expels the carbonic acid and causes the lime to settle in a chalky deposit on the containing vessel.

It is this which occasions the troublesome incrustations in steam boilers and the chalky deposits in teakettles used with hard water. A more commonly employed method is the use of washing-soda. The cheapest and best method when large quantities of water are to be used is to employ quicklime. For tolerably hard water, add one gallon of clear, freshly made lime-water to twenty gallons of the hard water, and allow it to settle twelve to twenty-four hours. A few experiments in testing



Animalcules and Infusoria in Thames Water.



Animalcules and Infusoria in Water.

PLATE XIII.

the water after the addition of the lime-water will suffice to determine the amount to add to any particular water to secure the best results.

It should be remarked that the hardness due to the presence of gypsum or sulphate of lime in the water cannot be remedied by the last method described. The only remedy is the use of washing-soda or carbonate of soda, or distillation. A water which produces a chalky deposit in the tea-kettle will be benefited by the lime process.

Distilled water is, of course, almost absolutely pure, though it has a "flat" taste and is not agreeable on that account. This is owing to the absence of air. Air may be readily restored, however, by agitation, as by pouring the water repeatedly from one vessel to another, or by getting it into a finely divided state by means of a spray. Another excellent method of aërating distilled water is to pass it through a charcoal filter.

Organic Impurities in Water.—For years it has been known that water may be the means of conveying into the system poisons of the most serious character. It has been positively shown in hundreds of cases that typhoid fever may originate in this way,—most frequently does, in fact,—and there is reason for believing that diphtheria, dysentery, cholera, and other epidemic diseases, may be carried by means of water.

The organic impurities of water are of two kinds: first, decomposing animal or vegetable matter; and second, living animalcules and germs. Both of these forms of organic matter are in the highest degree dangerous to health. As the two kinds of impurities always exist together, they may for the most part be considered together. The living creatures found in impure water are of numerous varieties, but are known by the general term animalcula. Excellent representations of some of these minute creatures are to be seen on PLATE XIII.

The sources of contamination of water are numerous. Wells, springs, and underground cisterns are very frequently contaminated by communication, either directly or indirectly, with a sewer or cesspool, or by the drainage from a barn-yard or a privy vault. Thousands of cases of typhoid fever have been traced directly to the use of water thus contaminated. Wells, cesspools, privy vaults, and cisterns are often located so near each other that communication is exceedingly easy, through the porous earth, and the contents of one become mingled with those of the other. The well, being deeper than either cesspools or vaults, becomes a drain for these receptacles of filth. Careful

experiments have shown that the area a well will drain in a porous soil is in proportion to its depth, the diameter of the circle drained increasing six feet with each foot of depth. Thus a well ten feet deep would drain a circle sixty feet in diameter, and any cesspool or privy vault, manure heap, or other collection of decaying matter within thirty feet of the well, would be almost certain to discharge more or less of its foul matters into the well. How well-water may be contaminated in this way is clearly shown in PLATE XVI. Twelve cases of typhoid fever occurred among persons using water from a well located as represented in Fig. 2 of the plate. When the surface of the ground or of the underlying rock is sloping, the danger is greatly increased.

Wells also often become contaminated by means of the death and decay of worms, bugs, and small animals which fall into them and are not removed by frequent cleaning. We were acquainted with one instance in which the water became so bad that it was believed that "a mineral spring had broken into it." The prospect of discovering such an anomaly led to a critical chemical examination of the water, and an inspection, which revealed the fact that sundry dead cats, toads, rats, cast-off shoes, garments, and other decomposable substances, had been deposited in the well and imparted to the water its mineral-spring flavor. Wells and cisterns should be often cleaned, and should be located at least ten rods away from any cesspool, vault, barn-yard, garbage heap, or other possible source of contamination, and should be so protected above that vermin and small animals cannot get in.

How to Detect Bad Water.—It is very important that every person should be familiar with the simple methods for determining with tolerable certainty and accuracy the character of water liable to be used for drinking and cooking purposes. The following methods are reliable:—

The Fermentation Test.—Put some of the water to be tested in a small bottle, and add a pinch of pure white sugar. Place it uncorked in a warm place. If cloudiness appears within two days, the water is too impure to be used with safety. Care must be taken to have the bottle perfectly clean. The cloudiness can be most easily discovered by holding the bottle up against a dark or black ground, in a good light.

Permanganate-of-Potash Test.—The following is the best form of this useful test, which is the most reliable of any simple method of examining water for organic impurities:—

Dissolve in an ounce of water twelve grains of caustic potash and three grains of permanganate-of-potash crystals. Keep in a glass-stoppered bottle. Add a drop or two of this solution to a gill of the water to be examined, placed in a perfectly clean and clear bottle. The permanganate solution has a beautiful pink or purple color. If this is changed to brown, or disappears after standing a few hours, the water is impure and unfit for use. The permanganate alone is found to be unreliable, as it sometimes fails to detect the presence of some kinds of organic poisons.

Suspended Impurities.—Water is often turbid from the suspension in it of substances which are merely mechanical impurities, the water becoming entirely pure after the removal of the same. The water of the Mississippi, otherwise considered remarkably pure, is very turbid or roily. The same is true of the water which is supplied to many of our large cities, at some seasons of the year, when the streams which furnish the supply are swollen by recent rains. Impurities of this sort can be best detected by holding a clear goblet containing the water against a dark background in a good light.

It is important, also, to observe the odor and color of water. The odor is best detected by shaking a quantity in a wide-mouthed bottle, half filled, and placing the nose to the mouth of the bottle. If no odor is detected, the liquid should be heated and examined again. The addition of a little caustic potash will sometimes bring out a bad smell not otherwise apparent.

Impure Ice.—Great quantities of ice are used in all parts of the United States, probably more than in any other country. Hence, it is of importance that ice, the solid form of water, should be pure as well as the liquid form of the article. There is a popular notion that water "freezes pure," which is in some degree true, but not to the extent commonly believed. If the lake or pond from which the water is taken is very impure, the ice will be likely to retain an injurious quantity of the same impurities. Animalcules and low forms of vegetable life which appear in lakes and ponds, usually exist in largest numbers at or near the surface. Decomposing organic matter also usually floats upon the surface. These pernicious substances may be entangled in ice, which may thus become a source of serious disease. Low forms of life readily withstand a temperature much below the freezing point of water, so that as soon as the ice thaws they become active agents in producing disease. We have often seen ice which gave forth a very unpleasant

odor while melting, and gave to the water in which it was placed a disagreeable flavor.

In the summer of 1875, a serious outbreak of sickness occurred at Rye Beach, a sea-side watering-place in New Hampshire, which was traced to the use of ice taken from a stagnant pond in which was a large quantity of decomposing sawdust.

Dr. Austin Flint, of New York City, had occasion some time since to investigate the probable origin of several cases of typhoid fever, and was unable to trace the disease to any other source than ice.

"Great quantities of ice are taken from canals, from creeks, from stagnant ponds, and from streams that are either the natural or the artificial recipients of surface drainage, of the outpourings of sewers, and of uncleanliness from various sources," and it is not at all improbable that it may be a vehicle for typhoid infection.

It is important to notice that "the danger from ice taken from improper places is not only from that which is drank, but from its use in refrigerators and preservatories, where milk, butter, fruits, vegetables, and meats are subjected to its saturating influence as it vaporizes." All would do well to look sharply to this possible source of disease and death. Find out the source of the ice which is purchased, and if there is a possibility of its being contaminated, reject it. It is better to do without ice altogether than to run any risk of contamination. Ice should never be gathered from stagnant water, nor from streams which are contaminated by sewage. No doubt many cases of illness arise from this source without being suspected, and possibly many deaths occur without the true cause being discovered.

The Purification of Water.—As impure water is so abundant, and pure natural water often so limited, it is important that simple and efficient means for the purification of water be generally understood and adopted. Some waters are so impure that no attempt to render them wholesome can be successful, at least sufficiently so to render their use safe or justifiable. Water which contains considerable quantities of sulphate of lime or magnesia, mineral waters, and water which is badly contaminated with sewage, or the drainage from cesspools, vaults, or barn-yards, are of this class.

To Remove Turbidity.—The fine particles often suspended in water obtained from rivers are usually of the nature of fine sand or finely divided clay. The greater share of the suspended particles will be deposited as sediment if the water is allowed to settle for a day or two.

A quicker way of clearing such water is to add to it a small quantity of alum, decoction of logwood chips, or the white of egg, stirring well and then allowing it to settle for a few hours.

To Remove Organic Matter, Color, and Foul Gases.—Organic matter is by far the most serious impurity usually found in potable waters, and upon its entire removal, more than upon anything else, depends the success of any method of purification. The methods described for removing turbidity will also in some measure remove the impurities mentioned in this paragraph, but by no means thoroughly. Boiling accomplishes much more, by expelling the gases and destroying the poisonous properties of the organic matter, and to some degree precipitating it. A solution of permanganate of potash may be used for the same purpose, a strong solution being added to the water contained in a convenient vessel and stirred thoroughly. The solution should be added drop by drop so long as its color changes in the water from a faint pink to a brown or yellowish color. Examinations may be made from time to time by placing a clear white glass goblet full of the water undergoing purification, in the middle of a sheet of white paper, and placing beside it a goblet of pure water faintly tinted with the permanganate solution, and viewing the two solutions in a clear light. As soon as a pinkish color begins to appear in the water, it should be allowed to stand an hour or two, after which it should be examined again, and the operation repeated, if necessary, until the pink color remains permanent.

Filtration.—The methods above described are, of course, only adapted to waters which contain but a very small proportion of organic or suspended matters. The only really efficient mode of purifying water, at least on any but a very small scale, is filtration. There are various forms of filters, of different degrees of efficiency. The chief filtering mediums are sand, spongy iron, and charcoal. Sand removes only the suspended matters. Spongy iron removes a small proportion of the organic matter, but impairs the water by impregnating it with iron. Charcoal removes the suspended matters, a great share of the organic matters, and animalcules and other low forms of life. Vegetable charcoal is very efficient, but animal charcoal is much more so. The filtering medium is employed either loosely packed or made into solid blocks or slabs. The water is filtered by being made to pass either downward or upward through the filtering material, the upward method being generally considered the most desirable, as filters constructed on

this plan will last longer than those in which by the constant downward action the water becomes foul sooner with suspended impurities.

The superior purifying power of charcoal is due to the oxygen which it contains, condensed in its pores in very active form, by which the organic elements are oxidized, or burned up, and thus rendered harmless. Charcoal possesses the property of condensing in its pores a large amount of oxygen, the amount varying with each variety of charcoal, according to the fineness of the grain of the wood from which it is made. The hardest, finest-grained woods make the best charcoal. As charcoal deteriorates with age, it should be newly burned when used for filters.

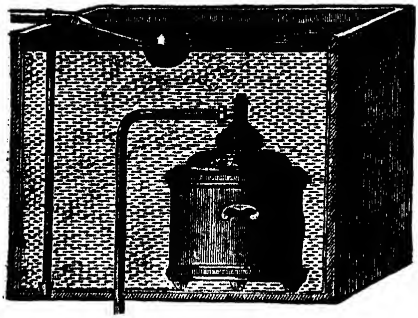


Fig. 169. A Reservoir Filter.

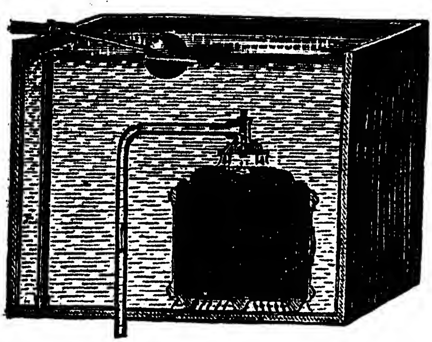


Fig. 170. Same as Fig. 169, but showing Filter in Section.

Some of the most common and efficient forms of filters are represented in Figs. 169 to 173. From the descriptions given, almost any one can construct, or hire made for a small sum, a really efficient filter.

Care of Filters.—The majority of people who purchase filters pay no attention to the directions for use which generally accompany them, and which must be attended to scrupulously or the filter will become a means of contamination instead of purification. The first thing essential in the care of a filter—and this is not often insisted upon by manufacturers—is that it should be allowed to become dry every day, or at least once in two or three days, being allowed to remain thus for an hour or two so that the charcoal may have an opportunity to absorb fresh oxygen from the air to enable it to continue its purifying process. The oxygen contained in the charcoal when placed in the filter is soon consumed, and, unless often renewed, the filter will

become worthless ; and from the accumulation of organic matter may become a breeding-place for germs. We have seen filters which in consequence of this neglect had become so foul within a few weeks that water which was comparatively pure, after being passed through them was found to contain large numbers of animalcules, and organic matter in large quantity, and had an odor highly suggestive of decayed eggs.

Fig. 171. Simple Form of Filter, for household use. *a.* Water-pan, or reservoir; *b.* Sponge; *c.* Jug to receive filtered water; *d.* Gravel; *e.* Charcoal; *f.* Faucet.

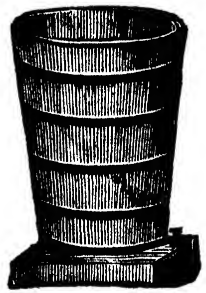


Fig. 172. A Filter made after plan shown in the preceding cut.

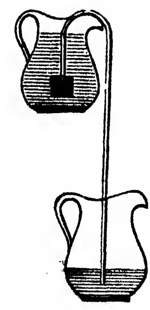


Fig. 173. Pocket Filter, arranged to use as a Siphon.

In order to be safe and efficient, a filter requires cleansing every few weeks or months, according to the amount of water filtered, and its quality. When ordinary cistern water is used, a filter should not be used longer than six months without cleansing, and if a large amount of water is used, not more than half that time. The sponge should be cleansed and scalded at least two or three times a week. The charcoal should be renewed every time a filter is cleansed. Fresh charcoal may be used, or the old may be renewed by heating to redness in a close vessel, excluding air.

The gravel and sand and the inside of the filter vessel, reservoir for filtered and unfiltered water, should be thoroughly cleansed whenever the filter is taken apart for cleansing. The surest way to secure thorough cleansing is to boil the gravel and sand in a large kettle or wash boiler for half an hour, rinsing out the filtering vessels with boiling water. After rinsing all well with clean water, wash everything with a strong solution of permanganate of potash and caustic potash.

A solution of one ounce of the permanganate and four of crude caustic potash in a pailful of water will be sufficient for an ordinary filter. If the permanganate solution becomes brown by the washing, more must be used, until a pinkish color remains when the gravel is rinsed. This will indicate that all impurities are removed. A few gallons of water will suffice to rinse away the remains of the permanganate, and the filter may be repacked as before, with fresh charcoal as directed. The closer the filtering medium is packed, the slower the water will filter through, but the more perfect will be the purification.

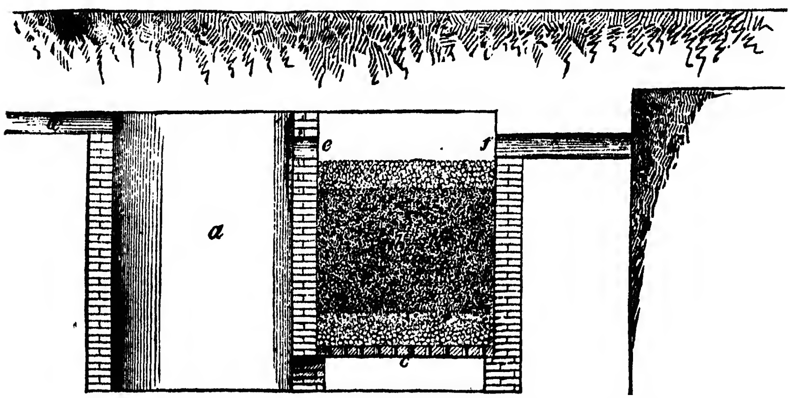


Fig. 174. Cistern filter. *a.* Receiving reservoir; *b.* Filtering medium, charcoal and gravel; *c.* Perforated slab; *d.* Rain-pipe; *e.* Overflow; *f.* Water-pipe leading to cistern; *g.* Cistern.

Cistern filters, as usually constructed, are not to be recommended, as they soon become clogged when placed in the cistern, and not being readily accessible are not easily cleaned, so that they become sources of impurity. The ordinary filter must be considered nothing more than a strainer by which the grosser impurities are removed. These enemies of life, germs, are capable of penetrating the material employed in most filters, such as charcoal, sand, spongy iron, and porous porcelain. The latter is the best of all for filtering material. It should be remembered, however, that if a filter of this description — a Pasteur filter for example, — is employed for filtering drinking water, the tubes must be removed and cleansed every few days.

The Best Water.—The purest water is always the best. Soft water is far superior to hard, though hard water free from organic matter is much to be preferred to soft water contaminated with organic impurities. In hard-water districts the use of filtered rain-water

should be generally adopted. By making proper provision for storage, almost any house affords roof surface sufficient to supply the family living in it with an abundance of the softest water. The average annual rain-fall between the thirtieth and fiftieth degrees of latitude is about forty-five inches. With this amount of rain, a roof affording four hundred square feet of surface would collect sufficient water to supply more than one barrel a day during the entire year, if none were wasted. It is best to have two or three cisterns, not only to supply sufficient storage capacity, but to allow opportunity for emptying one so as to clean it thoroughly as often as once in four or six months. Unless made of stone, cisterns should be bricked up from the bottom with good hard brick, and arched over. It is also best to cover the brick inside with a thick layer of Portland Cement. When tanks are used, the best material is iron, coated on the inside with coal-tar or some other impervious and insoluble covering.

Cesspools, water-closets, and sewers should never on any account be connected with tanks from which water is used for drinking purposes. Numerous cases of serious and even fatal illness have resulted from neglect of the observance of this precaution, as water has the property of absorbing foul gases to a considerable extent. On the same account, water should not be stored in the vicinity of anything giving out an offensive odor. Nothing could be more offensive to good taste and to sanitary principles than the custom of placing the water-tank of railroad cars in the water-closet. The offensive practice ought to be frowned down. It is by its property of absorbing foul gases that water becomes so unwholesome by standing in a sick-room, or over night in a sleeping-room.

It is essential that all of these particulars should be well looked after in order that water may be to the body only a blessing, and not a curse, as it becomes when the laws to which attention has been called are violated.

Mention has been made on pages 441 and 442 of the great danger of contamination of water, especially the water in wells, by the drainage from privy vaults. The enormity of this evil is by no means appreciated as it should be. An eminent sanitarian asserted not long since that a very large share of the wells of New England are so situated as to be in danger of contamination with excrement through the drainage from vaults. When a vault is used year after year without cleansing, the soil becomes saturated to a distance of many feet, especially when of a por-

ous nature. If a well is located within the area of saturation, from whatever cause, it will certainly be contaminated. Under such circumstances a well becomes a drainage pit for the filth-impregnated soil, and with every rain great quantities of soluble excreta, and, in many cases, germs of disease, are washed down into the well. The only proper remedy for this danger, as it is often impossible to get sufficiently far away to escape danger, is to abolish vaults altogether; but as this cannot always be done, the next best thing is to cleanse them frequently.

THE DANGERS IN MILK.

The general use of milk as a food for both children and adults renders it important that a special chapter should be devoted to this subject, especially in the light of modern researches which have connected with the use of this common article of diet a large number of grave maladies.

Omitting maladies concerning which authorities are still somewhat in doubt, the following may be mentioned as those concerning which the fact of the communication by milk is well established: Typhoid fever, cholera infantum, and tuberculosis, or tubercular consumption — three of the most deadly diseases known. It is very probable, also, that diphtheria, scarlet fever, and several other maladies are communicated through the medium of milk.

But if no other maladies than the first three named are liable to be disseminated by the use of milk, there is ample reason for regarding this article of food with grave suspicion until its purity and innocuousness have been established.

Numerous observations during the last twenty-five years have shown that milk is a frequent means of communicating typhoid fever infection. Infection of milk has sometimes been traced to the adulteration of the milk with water which had been contaminated by excreta from typhoid fever patients. In other cases the infection has occurred through the washing or rinsing of the milk cans or pails with infected water. There is, however, another source of infection which has been frequently overlooked.

It is generally held that cows are not subject to typhoid fever; nevertheless it is entirely probable that the capacious colon of the cow may serve as an excellent field for the development of typhoid

fever germs. While the digestive fluids of the stomach of a cow, as well as the gastric juice of the human stomach, are capable of destroying typhoid fever germs under certain conditions, it is doubtless true in the case of a cow, as with human beings, that derangement of the digestive organs may so alter the character of the digestive fluids as to deprive them of their power to protect the body from the invasion of germs by digesting these destructive organisms.

The importance of this subject is at once recognized when we consider the facility with which the fecal matters of the cow become mixed with milk, especially when cows are kept confined in a stable or small enclosure.

Recent bacteriological studies of the cause of typhoid fever have developed another fact which is of great practical interest in this connection.

Rodet and Roux, two eminent French investigators, as the result of extended investigations, have arrived at the conclusion that the so-called bacillus of Eberth is at least not the only cause of typhoid fever, but that in many cases the disease is due to another germ, the *bacillus coli*, a microbe which is constantly present in the colon of all mammals.

The immense importance of these facts will be recognized only when we take into consideration the facility with which cows may become infected with the excreta of human beings. Although no small care is taken to secure a pure water supply for human beings, very little attention, indeed, is given to the water supply of animals.

It is safe to say that very few people, indeed, are fully acquainted with the dangers to life and health which lurk in the milk supply. Strange as this may appear, a still stranger observation is the fact that almost every savage nation on the face of the globe that makes use of milk in any form, has learned by experience to adopt measures of protection of a more or less effective character, while the English and Americans are about the only peoples who seem to have profited nothing by sad experience in this particular.

Among most savage tribes milk is seldom or never used. The teeming millions of China — a country which contains nearly one-third of the entire population of the globe, are practically ignorant of this article of food. The high-caste Hindoo regards milk as a loathsome and impure article of food, speaking of it with the greatest contempt as "cow-juice," doubtless because of his observations of the deleterious effects of the use of milk in its raw state.

The savages of Central Africa make use of milk only after converting it into a sort of kumyss by leaving it for some hours in a gourd specially prepared for the purpose. A portion of the ferment is always left behind in the gourd, so that a strong degree of acidity is developed in a few hours.

The half-civilized Tartars of Western Asia prepare milk in the same manner, as do also the Turks and the Armenians. The natives of Italy use milk from goats instead of that from cows, a custom which will be better appreciated when the fact is known that goats are not subject to that dread disease, tuberculosis, so common among cows. Even the German peasant scalds the milk as soon as it comes from the cow, and makes little use of the article except in the sour state, in which it is comparatively safe. The Irish peasant is equally fond of sour milk, and the same is true of the natives of Scandinavian countries.

The French dairywoman scalds the cream before she churns it, experience having shown her that by this method a superior quality of butter may be made, although the philosophy of sterilization is probably unknown to her.

American and English people, as before stated, stand almost alone in the recklessness with which they make use of raw milk as a food and as a beverage, and in the fact that they seem to have learned nothing by the experience of centuries in the use of an article which is certainly responsible for a prodigious annual addition to the mortality list.

Let us glance into the conditions which give origin to the microscopic dangers to life and health which lurk in milk.

There are various germs which change the color of milk, each producing a characteristic color. Other germs produce a peculiar flavor, as acid or bitter, still others change the consistency of the milk, producing either a thickened or coagulated condition, or rendering the milk thready or viscid in character. The following are a few of the more important examples of this sort: —

Blue Milk.— The peculiar color of blue milk, not referring, of course, to milk which has been made blue by skimming, is due to the development of a peculiar coloring matter by the *bacillus cyanogenus*. The blue color does not appear, however, when the germ is planted in sterilized milk, but only by its growth in raw milk, as the development of the blue color requires the presence of lactic acid. A gray color is produced in sterilized milk.

Red Milk.—The *bacillus prodigiosus* gives rise to a red color, which appears in patches upon the surface of the milk. Two species of red yeast produce a red or brownish color, which first appears at the surface of the milk, then gradually extends until the whole is colored.

The *bacterium lactis erythrogenes* colors the whey only.

A dozen different lactic-acid-producing germs are ordinarily found in milk, and there are a great number of other germs which produce sour milk.

Freudenreich has shown that the unusually spongy condition often found in cheese, giving the cheese a swollen or puffy appearance, is frequently due to germs furnished by the intestines of the cow. Some germs ferment casein but do not produce lactic acid, but a sort of rennet. The germs which produce lactic acid are killed at a temperature of 158° F. The spores of some germs which ferment casein resist a temperature above the boiling point of water, sometimes even 248° F.

There are many of these germs, ten or more species of which are well known, besides a large number included under the general term, "potato bacilli," which comprise a great variety of germs that grow upon the surface of the earth, and also a large number of bacilli which cause butyric acid fermentation.

Cheese owes its properties to the development of these various germs at the expense of the sugar of milk, the casein, and the fat which it contains.

Drs. Schaffer and Bondzynski showed many years ago that cheese made from cooked milk does not mature.

Adametz has shown that the addition of thymol and other germicides to milk in making cheese prevents the maturing of the cheese.

Yeasts and Molds.—A variety of yeasts grow in milk. The characteristic action of yeast in milk is the production of lactic acid and alcohol. Some of these yeasts coagulate milk, others do not. Kumyss is one of the familiar products of the action of yeast upon milk. Kephir is a variety of kumyss produced by a peculiar yeast found in the so-called Kephir grains.

The red yeast already referred to, sometimes develops in cheese.

A white mold, *oidium lactis*, sometimes forms upon the surface of milk as well as upon other substances.

Green mold also sometimes attacks milk. It is, in fact, the

principal agent in the production of the famous Roquefort cheese. Brie cheese owes its peculiar properties to mold. In the manufacture of these varieties of cheese, the development of mold is promoted for the purpose of securing the peculiar flavors characteristic of these molds when grown in milk.

Yellow Milk.— *Bacillus synxanthus* produces a ferment which coagulates the milk, then a rennet which dissolves the casein and colors it yellow.

Bitter Milk.— There are many different germs which produce bitterness in milk. They are most likely to occur in milk which has been boiled and then allowed to stand for a long time. In raw milk they are overwhelmed by other germs, and do not develop; but the spores survive cooking and develop later. There are a few germs capable of causing bitter milk which resist the action of other germs and grow in raw milk.

Thready or Viscid Milk.— More than a dozen different germs have been described which produce a thready or viscid condition of the milk. It is a singular fact that this condition of the milk is promoted as the basis of the manufacture of Edam cheese. Conserves of thready milk are also made in Norway, where pains are taken to produce a viscid condition of the milk in the manufacture of a peculiar kind of preserved milk known as Tättemyelk. The condition is produced by adding small leaves of a species of grass, the *pinguicula vulgaris;* sometimes instead, the same grass is fed to the cows, which suggests at once the manner in which the milk may become infected. The cows eat the grass, the mouth and nose of the cow become infected, they transfer the germs to the udder, and from the udder they readily find their way to the milk pail.

Disease-Producing Germs.— Much more important from a sanitary point of view than the various yeasts, molds, and color-producing germs which have just been mentioned, are the pathological microbes, or disease-producing germs, many of which grow with great facility in milk. Some of the diseases arising from these germs, as cholera and typhoid fever, have already been referred to.

It has been shown that cholera germs grow with less facility in raw milk than in cooked milk, lactic acid interfering with the development of the cholera germ, so that sour milk may be, under certain conditions, safer as an article of diet than sweet milk, if the latter is uncooked.

Certain forms of influenza have been proven by Freudenreich,

the director of the Bacteriological Laboratory of Berne, Switzerland, to be transmitted by means of milk. This was found to be especially true of the peripneumonia of hogs.

Dr. Hart, an eminent English sanitarian, records fourteen epidemics of scarlet fever and seven of diphtheria, originating in England, in which the contagion was disseminated through the medium of milk.

Typhoid fever has been found to originate in the use of infected milk in a great number of cases, as has already been shown. The typhoid fever germs grow with great facility in milk.

One of the greatest of all the dangers connected with the transmission of germs by means of milk, is encountered in the fact that the germs of tuberculosis thrive in milk, and retain their vitality for many weeks even, in butter and cheese. The bacillus tuberculosis, the contagious element of the disease commonly known as consumption, is probably more frequently to be found in milk than any other dangerous germ.

Hirschberger, an eminent German authority, found ten per cent of the cows in the vicinity of large cities affected by tuberculosis.

Cows kept for dairy purposes in the immediate vicinity of cities, are generally subjected to much more unhealthful conditions than those in the country. The milk of half the cows examined, or five per cent of the entire number, was found to contain the tubercle bacillus. As the milk from the different cows was mixed together, it is probable that nearly the entire milk supply of the cities supplied by the cows examined, was infected with consumption germs.

An investigation of this subject made in Copenhagen a few years ago, showed tubercle bacilli in one seventh of all the specimens of milk examined.

Brouardel, an eminent French authority, found five cases of tuberculosis in a small boarding school of fourteen girls. The disease was traced to the use of the milk of a tuberculous cow.

Gasperini found tubercular germs alive in butter at the end of one hundred and twenty days. Gautier found them alive in cheese at the end of thirty-five days.

The importance of this subject can only be appreciated when bearing in mind the extent and increasing prevalence of tuberculosis in human beings.

The fact that in older populations, like those of England and New England, the proportion of deaths from consumption to deaths

from all other causes, rises as high as twenty or thirty per cent, while in the newer communities of the West the proportion falls to eight or ten per cent, is an evidence that conditions exist in intimate connection with life in a civilized community, which favor the development of this dread disease. The revelations of the post-mortem rooms connected with the metropolitan hospitals of this and other countries, have shown that sixty per cent of hospital patients who die have suffered at some time in their lives from infection by the bacillus tuberculosis, as evidenced by the characteristic lesions which have been left behind. The great majority have, of course, recovered from the disease,— thanks to favorable conditions and the natural recuperative powers of the body,— but this fact is, nevertheless, evidence that infection of the human race in civilized communities with the bacillus tuberculosis, has come to be, at the present time, exceedingly common. Indeed, it may be said that such infection threatens to become universal.

That tuberculosis may be communicated through the milk of tuberculous animals, at least under certain circumstances, is strongly suggested, if not absolutely proved, by the disproportionate frequency with which enteric consumption occurs in young children. A case recently reported in medical journals illustrates very clearly the possibility of infection by tuberculosis through the alimentary canal. Four infants were cared for by a tuberculous nurse, who fed the little ones with a spoon, and was in the habit of tasting the milk herself to test its temperature before each feeding. All four of these children suffered and died from enteric consumption — a very clear case of infection.

An important fact to which Prof. Law has called attention is this; namely, that even though the milk of a tuberculous animal may be proved to be free from tubercle bacilli, and hence not capable of giving rise to tubercular infection, or if the infected milk shall have been sterilized so that it no longer contains living bacilli, still these animal products are, nevertheless, capable of producing most potent mischief through the toxic products of the bacilli which they contain.

There is still another feature of this question to which, it seems to me, sufficient importance has not been attached; namely, the infection of human beings with tuberculosis by contact with tubercular animals, aside from the use of their flesh or milk as food.

That tuberculosis is usually contracted by the reception of germs into the air passages is a point upon which there will probably be no controversy. The reception of the microbes in the form of dust, by respiration, is unquestionably the most frequent form of contagion.

Sawisky, who has investigated the length of time that dried sputum retains these infectious properties, reports that virulence was retained for two and one-half months. He found this to be true even when the sputum was exposed to the sunlight, the destructive effect of sunlight upon microbes, which is well known, being only observed in the bacillus tuberculosis when the sputum was spread out in very thin layers.

A point of importance to which we wish to call special attention is the fact that the sputum of tuberculous cattle and the apartments occupied by such cattle are as dangerous a source of infection, and more so, than the sputum of human beings, or the apartments occupied by them.

It is doubtless true that contagion from animal to man is much more common than from man to animal, and yet that contagion may occur from man to animal cannot be doubted. A case is reported in which a flock of chickens became almost wholly tuberculous through eating the expectorated matters of a consumptive young man who had charge of them and fed them, spending considerable time with them in the yard.

Hoffman has shown that flies may take up the tubercle bacilli from infected sputum, and discharge them alive and active with their excreta. A number of flies fed upon infected sputum died after a few days. Whether death was due to the growth of the microbe or to the toxic effect of the tuberculin absorbed was not shown by the experiment. It is known that the bacilli of leprosy are communicated by flies alighting upon a raw surface, and I deem it quite possible that infection of the skin, resulting in lupus, or of the lymphatic glands, producing scrofulous enlargement, may occur in this way.

A curious fact to which attention has been called, is that earthworms may receive into their bodies and retain there in a virulent condition the tubercle bacilli for many months. The bacilli may be deposited upon the surface of the earth with the excreta of the worm, become reduced to powder, raised in the air by some passing

breeze, and thus find their way to human lungs. In this way the expectorated matter of cattle in pastures may find access to human beings.

In licking herself a cow suffering from tuberculosis may soil the hair about the udder or flanks with infected saliva, which, after drying, may be rubbed off during the act of milking and find its way into the milk. This may be a source of infection of milk, in cases in which, when taken with special precaution directly from the udder, the milk gives no evidence of infection.

The conditions under which milk is usually produced in civilized communities are such as to insure its contamination. The udder and other portions of the body of the cow become smeared with her excreta, or that of other animals, and this infectious material is in turn rubbed off by the contact of the hands or the clothing, or the switching of the animal's tail, and falls into the milk during the process of milking. The amount of foreign material of this sort which finds its way into the milk depends, of course, very largely upon the condition in which dairy cows are kept, as well as upon the care of the dairyman. Milk from cows in pasture is comparatively free from materials of this sort, although by no means wholly so, while milk from cows kept in stalls is certain to contain a considerable quantity of stable litter.

The average dairyman unwittingly imitates a heathen custom. The Hindoo, as already stated, makes no use of milk as an article of food, but often keeps cows for the purpose of supplying milk to his English and Mohammedan neighbors. The rules of his religion, however, require him to placate his deity for robbing the cow by performing certain religious rites, one of which consists in adding cow dung to the milk. Incredible as this statement may appear, I am certain it is authentic, as the statement was made to me by missionaries who had spent many years in India and were personally knowing to the facts. I was also informed that one great objection to the use of milk in India is the fact that it is invariably found to possess a strong flavor of cow dung. This objection not infrequently applies with a considerable degree of force to the United States milk.

When it is considered that in the cow's excreta are to be found germs of many varieties, from the ordinary germs of putrefaction to the most deadly pathogenic or disease-producing microbes, and requiring only a favorable soil in which to develop to enable them

to manifest their deadly properties, it will be seen that no small importance attaches to what is generally considered an insignificant or unimportant matter.

The housewife is ordinarily contented with straining the milk through a wire-cloth strainer, or, if exceptionally fastidious, she may employ a strainer of cloth. The universal practice of straining milk in some fashion is a recognition of the source of contamination which has been mentioned. But it probably is not generally known, or at least not considered, that this mode of purification removes from the milk only the coarser masses such as are readily visible to the eye.

A microscopic examination of the milk obtained from a cow in the ordinary manner shows that after the most careful straining it still contains a large number of germs and germ spores, which at the end of a few hours are found to have increased with such rapidity that thousands are to be found in every drop of milk, and at the end of twelve hours the number is often increased to millions.

Investigations conducted a few years ago at the experiment station of the State Board of Health of Connecticut, resulted in the discovery of more than thirty different kinds of germs in milk.

In conclusion I desire to say a few words with reference to proper methods in the production, care, handling, and use of milk: —

1. Cows must be fed upon proper food. Cows fed upon garbage soon suffer from indigestion, and the milk is thereby deteriorated in quality, not only by the poisonous products of decomposition communicated by the garbage through the cow to the milk, but also by the products of indigestion in the cow, which are equally deleterious in character, and which find their way into the milk by absorption and secretion by way of the mammary glands.

2. A cow must be supplied with an abundance of pure water. As much care should be taken to provide pure water for a milch cow as for a human being.

3. The milch cow should receive most scrupulous care as regards cleanliness. When a wet-nurse is to be selected for a young child, the nurse is usually required to bring a certificate from a physician that she is in sound health. A wet-nurse suffering from a skin disease, serious indigestion, decayed teeth, bad breath, or a constitutional taint of any sort, or who is of untidy habits, is at once rejected.

It is very remarkable indeed that we have been so slow in recognizing the fact that a cow is a wet-nurse for the entire family — the father, mother, older brothers and sisters, as well as the infant members of the family. The cow should be kept indoors only during the coldest weather, and should have daily exercise out of doors in all weathers. The stable should be airy and well-ventilated, thoroughly clean and free from stable odors; the cow herself should be kept thoroughly clean, and unless allowed an opportunity to groom herself in a natural fashion, should be as regularly and thoroughly curried as a carriage horse. Before milking, all the parts liable to contribute anything to the milk pail should be thoroughly clean.

4. The dairyman himself should be neat and tidy in his work. The vessels which receive the milk should be protected, so far as possible, from stable dust. In the investigation conducted at the Connecticut experiment station, among the germs found in the milk, was one species which produced the familiar characteristic odor of the cow pen, another gave that of a chicken coop, another produced the odor of a pig sty. The odors produced by other germs were equally characteristic of their origin.

To avoid the reception of germs and the absorption of poisonous volatile substances produced by the various germs which thrive in the vicinity of stables, the milk should not only be protected while in the vicinity of the milking stable, but should be removed as quickly as possible.

5. The milk should be quickly cooled after milking; not that there is anything injurious in the animal heat in the milk, but heat favors the development of the germs which, in spite of all ordinary precautions, are certain to be present in small numbers at least, while cold discourages the development of these organisms. A certain period of incubation takes place after the collection of the milk from the cow, varying in length from an hour or two to several hours, according to the temperature of the milk.

Experiments made in Germany have shown that milk which is cooled rapidly after milking, so that the period of incubation is sufficiently extended to allow of the consumption of the milk before the incubation is completed, is much less likely to produce disease than milk in which this precaution is not taken. The observations referred to were made upon a large number of children fed upon

milk from various sources and treated in different ways. In all cases in which sickness could be traced to the milk, it was found that the precaution of cooling the milk had been omitted, while those infants who were fed with milk which was promptly cooled after milking and kept cool, were almost wholly free from disturbances from this cause.

Cases of tyrotoxicon poisoning have been traced to the neglect of this precaution.

6. The milk-containing vessels themselves may be a source of contamination of the milk. This is a matter with which every housewife is acquainted.

Milk put into vessels which have not been properly scalded, promptly sours. Such milk, even though it is eaten before souring or other decomposition has occurred, is likely to produce disease in young children and other persons of feeble digestive powers, as the process begun in the pan is continued in the stomach. This is one of the reasons why milk fresh from the cow frequently agrees with invalids or with young infants, when milk can be taken under no other conditions without injurious results.

If the above-mentioned precautions are adopted, and care is taken to ascertain that the animal from which the milk is taken is in a fairly healthy condition and remains in a healthy state, no danger need be apprehended from the use of milk; but until the general public have become much more thoroughly educated upon this subject than is likely to be the case for some time to come, a wise precaution which may be safely adopted as a routine practice in the use of milk is sterilization or Pasteurization.

Sterilization consists in raising the temperature of the milk for a few minutes to the boiling point, or a few degrees higher. If the milk is heated to the boiling point or a temperature of about 210° for a few minutes, all deadly germs and most other germs will be destroyed. A few spores, however, are almost certain to escape, so that milk which has been merely boiled will not keep indefinitely.

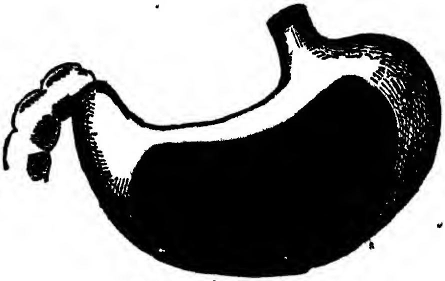
For this, it is necessary that the temperature should be raised several degrees above the boiling point, or to about 220° and held at this point for from ten to twenty minutes. The higher temperature named may be obtained by placing the milk in bottles, tightly corking, and boiling while immersed in a saturated solution of

common salt. It is necessary to leave the bottles in the solution until it is cool, as they will break if suddenly removed from the hot solution.

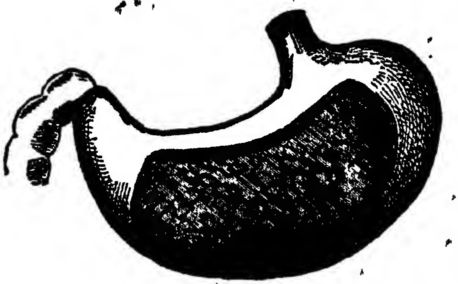
Objections have been raised to sterilization, on the ground that it changes both the flavor and to some degree the composition of the milk at the same time that it destroys the microbes which it contains. To meet these objections the method known as Pasteurization has been proposed. After using this method on a large scale for several years, I can heartily commend it. It consists in heating the milk to a temperature of 158°, and keeping it at that point for fifteen minutes. Exposure for this length of time to the temperature named will destroy typhoid fever germs, and all other disease-producing microbes which are at all likely to be found in milk, although it will not destroy all germs capable of souring milk or producing other forms of decomposition. The germs which produce decomposition of casein, such as takes place in the formation of cheese, require a temperature above that of boiling water. Pasteurization consequently cannot be depended upon for the long preservation of milk, but when carefully done, it is found that milk thus treated will keep from one to two days longer than raw milk. By the daily repetition of the process it is, of course, possible to preserve the milk practically unchanged for almost an indefinite length of time.

It should be mentioned that it is important to cool the milk rapidly after heating, as Pasteurization merely prolongs the period of incubation or development of many of the germs which it contains, and it is important to maintain as low a temperature as possible after the heating, as heat greatly favors the process of incubation, or development.

This method of treating milk preparatory to using it is by no means as troublesome as it may appear. There are no obstacles whatever to its practical adoption on a small scale in private families, and its use on a large scale is not a matter which offers any considerable difficulties. For the last five years I have had Pasteurized or sterilized all the milk consumed in the Sanitarium of which I have charge, amounting to 1200 to 1500 quarts daily, and the work has been accomplished by very simple arrangements. After the removal of the cream with a centrifugal separator, the milk is heated in large double boilers and afterward placed to cool in ordinary creamery tanks furnished with long, narrow receptacles.



A



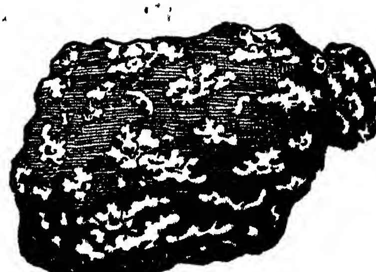
B

C

D

E

F



G

A. Healthy stomach. *B.* Congested stomach of moderate drinker. *C.* Ulcerated stomach of habitual drunkard. *D.* Stomach in delirium tremens. *E.* A rum blossom. *F. a. b.* Fatty nerve fibres of a drunkard; *c. d.* Fatty muscle fibres of drunkard. *G.* A gin liver.

PLATE XIV.—*EFFECTS OF ALCOHOL AND TOBACCO.*

STIMULANTS AND NARCOTICS.

The wide use of felicity-producing drugs is one of the most stupendous evils which afflict humanity.

Alcohol.—The alcohol habit is unquestionably one of the greatest of all blights which affect our modern civilization. The popular notion that it is a stimulant has given rise to its use not only as a beverage, but as a common remedy for disease, and with most disastrous effects. Introduced into the body, its first evil effects are manifested upon the stomach. Beaumont, in studying the effects of alcohol upon the stomach of Alexis St. Martin, noticed that even a small amount was sufficient to produce congestion and an inflamed appearance, while after the use of a large quantity, the mucous membrane of the stomach became swollen and blackened, yet St. Martin was scarcely conscious of any disturbance, and thought himself as well as usual—even imagined that whisky was beneficial to him.

Some of the effects of alcohol upon the blood and other tissues are represented in Plate XIV.

When long continued, alcohol produces worse effects; it causes inflammation of the stomach, foul ulcers, and cancerous disease of the organ.

Numerous Functional Diseases.—Close upon the derangement of the stomach, which is certain to come sooner or later with all drinkers, follows nearly every other functional disease possible to the human system. Every organ is disturbed. The whole vital machinery is deranged. Strange noises are heard in the head, occasioned by the rushing of the hot torrent of poisoned blood through the distended blood-vessels of the head, which pass near the ear. Black spots and cobweb appearances annoy the sight. Alcoholic amaurosis or amblyopia comes on, and sight becomes impaired; sometimes blindness follows. The dilated blood-vessels of the skin become permanently enlarged, especially in the face and nose, and the drinker gets a rum blossom. Skin diseases of various sorts are likely to appear, particularly eczema of the fingers or toes, or on the shins. An unquenchable

thirst seems to be ever consuming the blood, and nothing but alcohol will even temporarily assuage the desire for drink. Notwithstanding, large quantities of fluids will be taken, often amounting to several quarts a day, which overwork the excreting organs.

The liver and kidneys are disturbed in their function, one day being almost totally inactive through congestion, and the next rallying to their work and doing double duty.

Every organ feels the effect of the abuse through indulgence in alcohol, and no function is left undisturbed. By degrees, disordered function, through long continuance of the disturbance, induces tissue change. The imperfectly repaired organs suffer more and more in structure until the most extensive and disastrous changes have taken place.

Organic Diseases Induced by Alcohol.—The most common form of organic or structural disease due to alcohol is fatty degeneration, which may affect almost every organ in the body.

The Drunkard's Heart.—The fatty particles which exist in such increased abundance in the blood of those who use alcohol, are, after a time, deposited in various tissues where they are not needed, and in too great quantities. This deposit often occurs in the heart, and gradually replaces the muscular tissue of its walls, thus weakening the heart's power, and rendering it liable to fail altogether when called upon for a little extra exertion, and even to rupture from the force of its own feeble contractions. It is a fact well known to physicians that this is one of the most common causes of heart disease. We have seen scores of cases of heart disease in the large hospitals of New York and elsewhere, the larger share of which were in persons addicted to the use of liquor.

Alcohol a Cause of Apoplexy.—The fatty particles contained in the blood are very liable to be deposited in the walls of the arteries, as well as in those of the heart. The arteries of the brain are more frequently the seat of this degeneration than those of any other part of the system. Its presence here can be detected by the *arcus senilis*, an almost certain sign hung out by nature to give warning of the dangerous changes taking place. The arcus senilis is a yellowish ring formed in the cornea, just within the outer edge. It is caused by a deposit of fat, and indicates that the same change is taking place in the brain.

Alcoholic Consumption.—Dr. Richardson points out the fact that alcohol, instead of preventing, actually produces consumption,

and of a most fatal type. He states that a person suffering from alcoholic phthisis shows no improvement under treatment. The disease steadily, surely, and usually quite rapidly progresses to a fatal termination. The disease is most liable to attack those who seem to be almost invincible to the effects of alcohol, and who are often pointed to as examples of the harmlessness of alcoholic drinks. The disease often makes its appearance just when the drinker, alas! too late, is making up his mind that the poison is really hurting him, and is thinking of reforming.

The Gin Liver.—The appearance of a drunkard's liver is characteristic. "Hob-nailed liver" is another name for the diseased organ as found in spirit-drinkers. It is shrunken, hard, and almost totally useless, insensible alike to pain and to proper sensibility. Externally it looks like the hob-nailed sole of an English cartman's shoe, from which resemblance it received its name.

This kind of liver is found in those who have indulged in drink for several years. The livers of more moderate drinkers are found filled with fat.

These derangements of the liver give rise to numerous other disturbances, of which abdominal dropsy is one common form.

Alcohol a Cause of Kidney Disease.—All of the different forms of disease of the kidneys, commonly known under the name of Bright's disease, are common consequences of the use of liquor. The kidneys become worn out with overwork, and undergo the same degenerative changes suffered by other important vital organs. An eminent authority states that in England seven-eighths of all cases of disease of the kidneys are due to alcohol. Experiments made by the author have shown that under the influence of alcohol the efficiency of the kidneys in eliminating poisons is diminished nearly one-half. These deadly poisons are a source of almost any functional or organic disease. This fact accounts for the frequency of organic disease of the spine and other disorders in spirit-drinkers.

Alcoholic Insomnia.—While alcohol at first acts in many persons as a soporific, its final effects are to produce inability to sleep; or, if sleep is not wholly broken, a disturbed, unnatural, unrefreshing state of unconsciousness, hardly worthy of being called sleep, is induced. In natural sleep the supply of blood to the brain is greatly diminished, only a sufficient amount of the nutritive fluid circulating in the arte-

ries to carry on the reparative work of the brain. Unconsciousness is due to this fact. A condition of unconsciousness may also be produced by extreme congestion of the brain, a condition closely allied to that which just precedes apoplexy. This is the sleep of the drunkard. If he is not kept awake, through morbid, disordered action of the brain, due to an increased blood supply in its paralyzed arteries, he falls into an apoplectic slumber, in which he is haunted by horrid nightmares, goblins, ghosts, and frightful imagery, and awakes unrefreshed, unrecuperated. This unrefreshing sleep is produced by chloral and other narcotics, as well as by alcohol, a fact which shows the folly of attempting to remedy the alcoholic disease by dosing the patient with other drugs equally bad if not worse.

Nervous Disorders of Drinkers.—No class of persons are so subject to nervous diseases due to degeneration of nerves and nerve-centers as drinkers. The constant congestion of the brain and spinal cord occasions thickening of the membranes which inclose and protect these delicate parts, and gives rise to fatty degeneration and hardening, which causes loss of function. The paralytic condition which is at first temporary, existing only while the person is under the influence of alcohol, and manifested as partial or complete loss of muscular power, according to the dose, by degrees becomes permanent, as does also the loss of power to regulate or co-ordinate muscular effort, shown in the staggering steps of the drunkard. Partial or general paralysis, locomotor ataxia, epilepsy, and a host of other nervous disorders, are directly traceable to the use of alcohol.

A few years ago the writer made an extended series of observations to determine the influence of alcohol in so-called stimulant doses upon the nervous functions. By means of delicate instruments for measuring the acuteness of perception in relation to the several senses, it was found that a notable decrease occurred in the sensitiveness of the optic nerve, the muscular sense, and of the special nerves concerned in cutaneous sensibility.

Alcoholic Insanity and Idiocy.—The wild delirium of drunkenness, *mania a potu*, is too common to require description. By degrees, this condition may become permanent, through degeneration of the brain. The effect of alcohol upon the brain is particularly marked.

The brain, when healthy, is so soft that it would not retain its shape but for the skull. The sharpest knife is required to cut it without mangling its structure. It is necessary to immerse the organ in alcohol for weeks or months in order to harden it when a careful ex-

amination is essential. A drunkard's brain presents a marked contrast. It is already hardened, pickled almost. In the dissecting room it affords rare pleasure to a medical student to secure the desiccated brain of an old toper. The quantity of alcohol in the brain is sometimes so great that it can be collected by distillation after death. Alcohol has been found in the ventricles of the brain in a sufficiently pure state to burn when a match was presented to it.

Intemperance is now generally recognized as the greatest of all causes of insanity. According to the statistics of insanity in France, thirty-four per cent of the cases of lunacy among males were due to intemperance. One-half of the inmates of the Dublin insane asylum owe their disease to the use of liquor.

Lord Shaftesbury, chairman of the English Commission on Lunacy, in his report to Parliament stated that six out of every ten lunatics in the asylums were made such by alcohol.

Dr. Willard Parker, one of the oldest and most eminent physicians of New York City, remarks as follows on this point:—

"Pritchard and Esquirol, two great authorities upon the subject, attribute half of the cases of insanity in England to the use of alcohol. Dr. Benjamin Rush believed that one-third of the cases of insanity in this country were caused by intemperance, and this was long before its hereditary potency was adequately appreciated. Dr. S. G. Howe attributed one-half of the cases of idiocy in the State of Massachusetts to intemperance, and he is sustained in his opinion by the most reliable authorities. Dr. Howe states that there were seven idiots in one family where both parents were drunkards. One-half of the idiots in England are of drunken parentage, and the same is true of Sweden, and probably of most European countries. It is said that in St. Petersburg most of the idiots come from drunken parents."

Alcohol Predisposes to Disease.—The great number of observations on this subject leaves no room to doubt that the use of alcohol is one of the most potent influences in increasing the susceptibility to the influence of disease. It is in no sense a preventive.

Dr. Anderson, of Glasgow, says, "I have found the use of alcoholic drinks to be the most powerful predisposing cause of malignant cholera with which I am acquainted. In Warsaw, ninety per cent of all who died of cholera during the epidemic of 1832 were habitual drinkers." In the city of Tiflis, containing 20,000 inhabitants, every drunkard was swept away by cholera. In the Park Hospital, New

York, there were two hundred and four cases of cholera during an epidemic of the disease. Of these, only six were temperate, and they recovered, while two-thirds of the remainder died.

In the late epidemic of yellow fever in this country the proportion of victims among inebriates was nearly as large.

"Four-fifths of those who were swept away by the dreadful visitation of the cholera in 1832 were addicted to intoxicating drinks."

The whole population of St. Petersburg and Moscow ceased drinking liquor, being convinced that it was almost certain death to continue its use.

M. Huber said, "Persons given to drinking were swept away like flies."

Alcohol predisposes to other diseases as well as cholera. A very slight injury to an intemperate man is likely to result fatally. Surgeons in city hospitals find that they cannot expect the same degree of success in operations upon drinkers that they expect in the cases of temperate persons, a very slight operation, which would have occasioned no inconvenience in a total abstainer, often ending fatally.

Stanley says, "No drunkard can live in Africa." It is also well known that English soldiers in warm climates suffer from disease just in proportion as they indulge in liquor or abstain from its use. Dr. W. B. Carpenter cites in proof of this fact the returns of the sickness of European troops of the Madras army for 1849, in which the men were classed as abstainers, temperate, and intemperate. The report showed that the relative proportions of these classes admitted to hospitals were sixty abstainers and sixty-six temperate, to one hundred intemperate.

The same difference is shown in England between the Sons of Temperance and the Odd Fellows' Associations. The average number of days of annual sickness for each member of the Sons of Temperance was five; that for the members of the Odd Fellows' Unity, many of whom, though not all, used liquor in a moderate degree, was seven and seven-tenths days, or an excess of more than one-half.

The following formidable array of maladies has been attributed to the direct or indirect influence of alcohol:—

Gout, rheumatism, heart disease, dyspepsia, disease of kidneys, dropsy, obesity, disease of the liver, apoplexy, degeneration of the muscles, tremors, ulcers, insanity, palsy, jaundice, epilepsy, consumption, melancholy, cancer, amaurosis, paralysis, hysterics, convulsions,

gastritis, enteritis, ophthalmia, carbuncle, boils, fatal obstruction of lacteals, tabes, syncope, diabetes, lockjaw, idiocy, impotency, mania, delirium tremens, Bright's disease, disease of the arteries, atrophy of the liver, congestion of the liver, and numerous other organic and functional derangements.

We were informed by one of the visiting physicians of Bellevue Hospital, New York, that at least two-thirds of all the diseases treated there originated in drink.

Much additional testimony and an almost unlimited number of facts might be further adduced in support of these statements, but the above may suffice. We shall now undertake to show that—

The Use of Alcohol Decreases Longevity.—It is very easy to prove that the influence of alcohol, as of every other poison, is to shorten life. Dr. Willard Parker, of New York, shows from statistics that for every ten temperate persons who die between the ages of twenty-one and thirty, fifty-one intemperate persons die. Thus it appears that the mortality of liquor-users is *five hundred per cent greater* than that of temperate persons. These statements were based on the tables used by life insurance companies.

Notwithstanding the constant protest of both moderate and immoderate drinkers that alcohol does not harm them, that it is a necessary stimulus, a preventive of fevers, colds, consumption, etc., and the assertion of certain scientists that it is a conservative agent, preventing waste and so prolonging life, the distinguished English actuary, Mr. Neison, has shown from statistical data which cannot be controverted, that while the temperate man has at twenty years of age an average chance of living forty-four and one-fifth years, the drinking man has a prospect of only fifteen and one-half years of life. At thirty years of age the temperate man may expect to live thirty-six and one-half years, while the dram-drinker will be pretty certain to die in less than fourteen years.

A London Life Insurance Society divides its insurers into two classes, abstainers and moderate drinkers. It is found that during the last twelve years the mortality has been one-fourth less among abstainers than among the moderate drinkers; that is, only three abstainers die to four moderate drinkers.

Dr. Magnus Huss asserts that in Sweden 1,500,000, or about one-half the whole population, annually consume an average of one hundred and sixty pints of spirits each. By this excessive indulgence in drink, the Swedes already show distinct marks of deterioration in stature and longevity.

Between 60,000 and 100,000 persons die annually in America alone from the effects of liquor. A still larger number die in Europe from the same cause. Then in these two countries a human being dies every two and one-half minutes from alcoholic poisoning.

The graves of the victims, allowing twelve square feet for each, would in fifty years nearly cover a township. Arranged end to end, their coffins would make a continuous line from Cape Horn to the North Pole.

Arranged in one long funeral procession, with a hearse and a single vehicle for mourners for each, this vast army of dead drunkards would occupy two and a half years in passing a given point, and would wind two and one-half times around the globe.

Effects of Moderate Drinking.—Moderate drinkers do not escape. "Chronic alcoholism" is the disease which fastens upon them, and its symptoms are as distinct as those of any other disease. Gout and rheumatism are the special patrons of the moderate topers, the wine-bibbers. Neuralgia is another comforter of small tipplers. General nervous debility and dyspepsia also find a great proportion of this class among their victims.

It is quite useless for moderate drinkers to suppose that by using alcohol in small quantities they escape its evil effects. It is a poison in all doses. As Dr. Smith says, "In whatever dose, the direction of the action of the alcohol must be the same."

Says Dr. Chambers, "The action of frequent divided drams is to produce the *greatest amount of harm* of which alcohol is capable, with the least amount of good." It may be said, without exaggeration, that moderate drinking occasions all the ill effects of intemperance; for every drunkard begins his course as a moderate drinker.

James Miller, in his work on Alcohol, says, "Alcohol to the working human frame is as a pin to the wick of an oil-lamp. With this you raise the wick from time to time, and each raising may be followed by a burst of brighter flame; but, while you give neither cotton nor oil, the existing supply of both is, through such pin-work, all the more speedily consumed."

Dr. W. B. Carpenter has shown that the largest quantity of alcohol which can be taken daily without producing the poisonous effects and serious consequences pointed out is one to one and one-half ounces. A larger amount may seem to be tolerated, but it is doing its slow work of death all the same, gradually, but surely. Judged by this

standard, which is based upon scientific facts admitted alike by the advocates and opponents of the use of alcohol, a large proportion of those who use alcohol at all are being slowly poisoned by it. The effect of the constant action of a small quantity of the poison is far greater than that of excessive, but only occasional, quantities. Hence the habitual moderate drinker, even of wine, beer, or hard cider, is much more subject to chronic nervous disorders and degenerations of various sorts than the man who goes on a spree once in two or three months.

Hereditary Effects of Alcohol.—The drinker himself is not the only sufferer from his vice. Indeed, it seems in many cases that he is not the greatest sufferer. He may even live out his threescore years and ten, in apparent defiance of the laws of nature and the warnings of friends; but look at his children. Are they as strong and robust as he? Oh! no; instead, we often see them frail, nervous, imbecile, idiotic,—poor specimens of the race. The iniquities of the father are visited upon the children.

"There are those [thousands] who have had diseased physical organisms bequeathed to them, and they are suffering from an irritable brain and an eccentric habit of thought, because their fathers drank spirits."—*Dr. Edmunds.*

Says the eminent Dr. Parker, whom we have before quoted:—

"The hereditary influence of alcohol manifests itself in various ways. It transmits an appetite for strong drink to children, and these are likely to have that form of drunkenness which may be termed paroxysmal; that is, they will go for a considerable period without indulging, placing restraints upon themselves, but at last all the barriers of self-control give way, they yield to the irresistible appetite, and then their indulgence is extreme. The drunkard by inheritance is a more helpless slave than his progenitor, and the children that he begets are more helpless still, unless on the mother's side there is engrafted upon them untainted stock. But its hereditary influence is not confined to the propagation of drunkards. It produces insanity, idiocy, epilepsy, and other affections of the brain and nervous system, not only in the transgressor himself, but in his children, and these will transmit predisposition to any of these diseases."

Probably nowhere in the civilized world—unless it be among the natives of the Sandwich Islands who are being rapidly exterminated by drink—are the baneful effects of alcohol upon the race seen more vividly than in Norway and Sweden. In Norway the spirit duty was removed

in 1825. In the next ten years insanity increased fifty per cent, and the number of children born idiots increased *one hundred and fifty per cent.*

In Sweden there are at least a million and a half persons, each of whom annually consumes eighty to one hundred quarts of whisky. Young children drink with their parents; and even infants are quieted to sleep by giving them a rag soaked in whisky to suck. According to Dr. Huss, the consequence of this is that "the whole people is degenerating; that insanity, suicide, and crime are frightfully on the increase; and that congenital imbecility and idiocy are in fearful proportion to the numbers born." Charcot, the eminent neurologist of Paris, declared that the children of drinkers inherit tendencies to all the neuropathies, or nervous disorders. This toxicopathic heredity is now recognized by most authorities.

Effects of Alcohol upon the Character.—The ultimate effects of alcohol upon the character are well shown by its immediate effects. As the cerebrum is gradually brought under the influence of the drug, the will becomes dormant and the leading characteristics of the mind become predominant. A man under the influence of liquor shows out his real character. The restraining influences of culture and education are lost, and those tendencies and properties which have been held in check by force of will, assert their sway, and all that is low and beastly in the individual comes to the surface. It is this that causes individuals to commit, under the influence of drink, crimes which they would never have perpetrated in their sober moments. It is rare indeed that a premeditated murder is committed without the murderer being under the influence of drink. He feels the need of something to paralyze the voice of conscience and make powerless the moral force of education, of natural regard for human life; and alcohol does just that.

When liquor is frequently indulged in, the lowered moral status becomes, after a time, a permanent state, which has been thus graphically pictured by Dr. Fothergill:—

"The most pronounced product [of alcoholic demoralization] is found in the hopeless drunkard, who, in squalid rags, with rotten tissues, the embodiment of intellectual and moral degradation, utterly beyond hope, the line of possible restoration long past, hangs around the tavern door, and with the odor of alcohol floating on his breast, whiningly begs a copper from the mass of vitality around him, of which he himself is a withered and decaying branch. This man is incapable of labor; he is unwilling to entertain the idea of toil. He is beyond any capacity for labor: he is no longer capable of discharging his duty as a citizen; he is

a social parasite of the lowest and foulest order, as useless as a tape-worm. He has abandoned all self-respect, because there is nothing left in him for himself or any one else to respect. He is a shameless liar, who will make the most solemn protestations as to the truth of what it is patent enough is false. There is no depth of moral degradation to which he will not descend for means to purchase a little more of the fluid which has ever been his bane."

It has been estimated by competent judges that intemperance is the cause of nine-tenths of all the crime among civilized nations. Alcohol benumbs the intellect, deadens conscience, and stifles reason. It leads its victim to theft to secure the means of indulgence, and steels the heart of the assassin for his bloody work.

To the crimes committed by the users of alcohol, themselves, should be added those committed by the wives and children of drunkards, who are driven to desperation and crime by the want and suffering occasioned by the cruel monster, drink.

The influence of liquor in increasing crime has often been well illustrated by the sad results which have invariably followed its first introduction into any community. Many newly settled districts have existed for several years with entire exemption from crime; no murders, no thefts, no public broils, no assaults upon persons or property, no act of violence of any kind occurring to mar the peace and destroy the feeling of security of the community. At last a public house is opened in the midst of this prosperous and peaceful society, and a bar is erected, from which alcoholic liquors are dispensed. The evil consequences are immediately apparent. Drinking engenders idleness. Idleness necessarily brings want, and want leads to theft; for a man who spends money for illegitimate purposes will not long continue particular to obtain his means from legitimate sources. Idleness and the conscience-searing, passion-stimulating influence of alcohol soon lead to acts of violence against persons and disregard of individual rights. Midnight carousals and drunken revels become frequent, outbreaking crimes are not uncommon, and the once peaceful community becomes a scene of constant disturbance and disquiet. The sheriff and constable, who previously found no occasion for the exercise of the functions of their offices, now find constant employment. A jail becomes a necessity, and is never without an occupant.

To say that alcohol is responsible for the revolution in the condition of such a community, would be to state a fact too plain to be mistaken.

Another evidence of the influence of liquor-drinking upon crime is seen in the fact that crime increases and decreases in any particular locality almost in proportion to the increase and decrease of the use or sale of liquor.

During seven years from 1812 to 1818, the annual consumption of liquor in England and Wales was 5,000,000 gallons; during the same period, 11,000 persons were annually arrested and committed for trial. During the seven years from 1826 to 1832, 9,000,000 gallons of liquor were annually consumed, and the annual number of arrests was 21,700. It will be observed that the amount of liquor sold during the last period was almost double that consumed during the first, and also that the number of arrests was nearly doubled during the last period. That this increase of crime was due to the influence of liquor and not to increase of population, is shown by the fact that while crime had doubled, the population had increased but one-third.

Says Dr. Nott, "In Scotland, in 1823, the whole consumption of intoxicating liquors amounted to 2,300,000 gallons; in 1837, to 6,776,-715 gallons. In the meantime, *crime increased 400 per cent*, fever 1,600 per cent, death 300 per cent, and the chances of human life diminished 44 per cent."

"In Ireland, when the distilleries were stopped, in 1808, crime decreased amazingly. Again, when in 1810 they recommenced operations, the commitments increased nearly fourfold."—*Bacchus Dethroned.*

The increase of crime incident to the increased use of liquor is, of course, due to the influence of alcohol upon the moral nature of individuals. The direct effect of this poisonous drug seems to be to paralyze the will, to render the sensibilities obtuse, to deaden the conscience, to inflame the passions, to weaken the judgment, and to dethrone reason. Kleptomania (an uncontrollable disposition to steal) is one of the acknowledged effects of drink.

It is a well-established fact that the "social evil" is largely supported by the use of liquor. Brothels and public houses are frequently connected. Liquor and licentiousness go hand in hand.

An eminent physician remarks with reference to the moral effects of alcohol, "When alcoholism does not produce insanity, idiocy, or epilepsy, it weakens the conscience, impairs the will, and makes the individual the creature of impulse and not of reason. Dr. Carpenter regards it as more potent in weakening the will and arousing the more violent passions than any other agent, and thinks it not improbable

that the habitual use of alcoholic beverages, which are produced in such great quantities in civilized countries, has been one great cause of the hereditary tendency to insanity."

Dr. Elisha Harris, late President of the American Public Health Association, and Corresponding Secretary of the New York Prison Association, states that of 100,000 prisoners 82,000 were committed through the influence of drink.

Adulteration of Alcohol.—We have scarcely mentioned the fact that alcohol is subject to adulteration to an almost unlimited extent, as we do not regard this fact as of so very great importance, since alcohol is the chief poison in all liquors, whether adulterated or not, and, with rare exceptions, is worse in its effects than any of its adulterants. It may be remarked, however, that there is very little pure liquor to be obtained. The following substances, with many others, are used in adulterating the various alcoholic beverages in common use:—

Burnt sugar, sulphate of potash, sulphate of iron, alum, salt, cocculus Indicus, picric acid, colchicum, tobacco, capsicum, ginger, wormwood, sulphuric acid, cream of tartar, carbonate of potash, hartshorn, strychnia, lead, laurel-water, cochineal, logwood, sugar of lead, oil of turpentine, gentian, and opium.

THE MEDICAL USE OF ALCOHOL.

This question is one which at the present time is exciting a great degree of interest in the medical world, and we should neglect an important part of our task if we should fail to devote the space to it which its importance well demands.

The medical use of alcohol is the strong fortress into which the moderate drinker runs when hard pressed by the advocates of total abstinence. It has always been a sort of Gibraltar for intemperance. The admission of the medicinal use of alcohol as a stimulant, tonic, conservator or generator of vital force, has been the rotten plank in the temperance platform. It has made the defenses of teetotalism, otherwise impregnable, exceedingly vulnerable. Temperance reformers have kept this part of the subject in the background as much as possible; but moderate drinkers have persisted in making it prominent on every possible occasion, often to the great discomfiture of the advocates of total abstinence for the well, but unlimited indulgence for the sick.

It has become evident to those who have given the matter candid thought, that either the common employment of alcohol as a medicine is a stupendous error, or teetotalism is a fanatical delusion. Which of these positions is the true one? It must certainly be that one which best agrees with facts—scientific facts—and the dictates of reason and common sense.

No other drug is employed so largely in medicine as alcohol. It is not only prescribed in the form of alcoholic drinks, but in combination with other drugs, in all tinctures, and many other pharmaceutical preparations. Still greater quantities reach the stomachs of the people through a host of quack remedies, patent medicines, known under various delusive names, as cordials, bitters, tonics, restoratives, etc.

Medical Properties of Alcohol.—According to the classical authors on materia medica, alcohol is a *nervine, stimulant, tonic, narcotic, diaphoretic, diuretic,* and *caustic.* Its varied properties are urged as sufficient apology for its so general use, they making it applicable, as supposed, to almost any actual or imaginary case of disease.

It should be remarked that a medical property is not, as generally supposed, a certain mode of acting upon the system possessed by a drug, but rather an indication of the manner in which the system acts toward the drug. It is evident, then, that the medicinal properties of alcohol, before enumerated, are so many terms for indicating a corresponding number of disturbances or disorders which the drug occasions in the body.

When medical authors say that alcohol *acts* so and so, we must understand them to mean only that the drug *occasions* such an action on the part of the system.

As the relations of any drug to the body in disease are determined by observing its effects upon the body in health, it will be instructive for us to glance again, for a moment, at the effects of alcohol upon living tissues as determined by experiment.

When applied to plants, says Pereira, a noted medical writer, "alcohol acts as a rapid and fatal poison."

Says the same author, "Leeches immersed in spirit die in two or three minutes." Frogs and snakes are affected in the same manner.

We have seen the heart of a turtle contracting vigorously several hours after removal from the body of the reptile. When placed in alcohol, its contractions cease in less than a minute.

Alcohol causes paralysis when applied directly to the trunk of a nerve. It has the same effect when applied to a ganglion. If a pigeon's brain be exposed by removing a portion of its skull, alcohol may be applied directly to the cerebellum. The effect produced is essentially the same as that which follows the removal of the cerebellum by the knife. The poor pigeon plunges and staggers about like a drunken man, and for precisely the same reason.

If a little alcohol is added to a vessel of water containing live minnows, they will speedily die.

Applied to the skin, and retained by some impervious covering to prevent evaporation, alcohol produces irritation and numbness.

Applied to the mucous membrane of the eye or mouth, still greater irritation is occasioned. When taken into the stomach undiluted, it produces intense irritation, inflammation, and ulceration, as proved by Dr. Beaumont's observations upon Alexis St. Martin.

When mingled with the blood, alcohol destroys the blood corpuscles, increases the proportion of fat, renders the blood less capable of passing readily through the capillaries, coagulates the fibrine, and injures the nutrient elements of the plasma of the blood. When a considerable quantity of alcohol is taken, the distinction between venous and arterial blood is almost destroyed, all of the blood assuming a dark hue. It was thus that the English nobility, through habits of dissipation, became distinguished for their blue blood, which was by them considered an evidence of noble origin.

But alcohol does not remain in the blood. It permeates every tissue, and for some curious reason not yet satisfactorily explained, accumulates in nerve tissue more than in any other, unless it be the liver, which would very naturally receive the most, since alcohol when received by the stomach is carried directly to the liver by the portal vein, as soon as absorption occurs.

The effect of alcohol upon the nerves is to lessen sensibility. A man whose nerves are bathed in alcohol has the acuteness of all of his senses somewhat impaired. The degree of impairment depends upon the amount of alcohol present. A large quantity of alcohol destroys sensibility entirely.

We have observed that alcohol is "a rapid and fatal poison to plants," that it kills leeches, frogs, reptiles, and minnows, that it irritates the skin and mucous membrane, destroys the blood, and paralyzes

the nerves. In considering these effects, Prof. Christison, Dr. Pereira, Dr. Taylor, Prof. Orfila, and other authorities of equal note, pronounce it a "*narcotico-acrid* poison."

Says Dr. E. Smith, "It is a poison of the nervous centers."

Says Dr. Edmunds, of England, "There is no great city on our side of the ocean where there are not inquests held upon men who drink a bottle of brandy, and fall down and die just as if you had given them a spoonful of prussic acid. Alcohol is a poison."

Says Dr. Willard Parker, of New York, "By physiological inquiries it has been established that alcohol is a poison."

The Vital Instincts Treat Alcohol as a Poison.—If there should remain the least shadow of a doubt in the mind of any one that alcohol is a poison, it must certainly be removed by considering how the system treats this drug when it is taken into the stomach. At first the mucous membrane becomes congested, and throws out a quantity of mucus to protect itself from the alcohol, while the absorbents increase their activity for the purpose of getting the drug out of the stomach as quickly as possible.

Having entered the blood, it is transported at once to the liver, which does its best to extract as much as possible of the poison, though at imminent peril to itself. Very soon the poison-laden blood reaches the heart. This organ also recognizes the drug as something which has no place in the blood and ought to be removed; and, as it cannot directly effect the removal itself, it pumps a little harder at the circulation in order to hurry the impure blood along to those organs which are especially designed to remove impurities. Hence the increased force and frequency of the pulse.

The first of these organs which the hastening blood reaches, is the lungs, and here the volatile poison is sent out in volumes. Every one knows that a drunkard's breath smells like a beer shop. The alcohol is also expelled by the kidneys and the skin, and can be found in the urine and the perspiration. In fact, every excretory organ of the body is engaged in getting rid of this poison.

A food or a friendly substance is not treated in this way. If alcohol is a good thing, it is certainly very much abused by the vital instincts. But the vital instincts are not easily deceived. They recognize food in an entirely different manner. An apple, a potato, milk, or bread, when taken into the body, is utilized. It disappears, and never re-appears as

milk, or bread, or apple, or potato. Not so with alcohol. It enters the system alcohol, and leaves it precisely the same as it entered, remaining the same all the way through. Instead of retaining the drug, digesting and assimilating it, the system hurries it out in every possible way. The escaping poison can be detected in the breath for more than twenty-four hours after a small quantity has been taken. It is long retained in the body, and has been distilled from the brains of drunkards thirty-six hours after its reception into the body.

If, after eating apples, potatoes, and sundry other articles, the same articles should be found, upon a post-mortem examination, in various portions of the body, apples in the brain, potatoes in the liver, and other articles in other parts, it would be considered as the most indubitable evidence that those articles,—apples, potatoes, etc.,—were not food, since they were not used or changed in the body. If we found these same articles passing out of the body, we should be led to the same conclusion. This is just the experience with alcohol. The conclusion, then, is unavoidable, that it is not food, but poison, as eminent physicians have declared.

Says Dr. Parker, again, of alcohol, "It is not a food, nor should it be used as a common beverage."

The assumption that alcohol is a food is chiefly based upon the fact that when alcohol is taken into the system, all of it does not reappear in the excretions. A very small portion of it is oxidized, and appears in other forms, showing that it has undergone a change in the body. The amount of alcohol which can be thus changed is very small, amounting to not more than one half ounce every twenty-four hours. Hence, many of those who assert its food value admit that this applies to alcohol only in very small doses.

But are we justified in asserting that alcohol is a food, simply because it undergoes a chemical change in the system? This same fact appears in relation to quinine, strychnine, and a variety of substances which no one would think of recommending as foods.

But there is something more to be said upon this point. What is the value of a food? Is it not true that we employ food for the purpose of supplying the body with heat or force, or replenishing some tissue? It is admitted that alcohol does not nourish a single tissue. Experiments show that after a man has taken alcohol, he is unable to lift as much as before; that he is unable to endure as much labor as a total abstainer.

It has also been determined that when a man is under the influence of alcohol, his bodily temperature falls, which shows that this drug decreases animal heat instead of augmenting it.

Does Alcohol Supply Force?—Many years ago Prof. Liebig announced the theory that alcohol was "respiratory food." By the term respiratory food he meant that it underwent combustion in the body and thus produced heat and developed force. All the moderate drinkers and topers rejoiced at this supposed discovery, and consoled themselves with the idea that taking a whisky punch was only a pleasant way of eating; and that a man when "gloriously drunk," was merely developing a tremendous amount of force. But scientists ascertained, after a time, that Prof. Liebig, to use the language of Prof. Davy, F. R. S., "adduced no physiological evidence in support of his assertion." Prof. Liebig observed that his neighbors and most of his countrymen loved beer, wine, and brandy; he loved the beverages himself. He observed also that nearly every nation employed some kind of alcoholic drink. The very natural conclusion in his mind was, alcohol is used in the body for some good purpose; and his theory was merely an attempt to explain such a use.

If Liebig's theory were true, then alcohol would disappear in the body, and only its ashes, the products of its combustion, would appear. Unfortunately for the theory, MM. Lallemand, Perrin, and Duroy, three French chemists, by careful experiments proved that, when taken into the body, alcohol *passed out again unchanged.* Hence it was not burned; and hence it did not produce either heat or force. Dr. Edward Smith, F. R. S., repeated their experiments and confirmed their results. The fact that alcohol is unchanged in the body was still further confirmed by the observation that none of the products of the combustion of alcohol, its ashes, were to be found in the blood or the excretions.

The inevitable conclusion from these experiments is that alcohol does not contribute to the production of either heat or force.

Says Dr. Edward Smith, "Its direct action is to lessen nervous force."

"Is 'vital force' augmented by it, or not? All the facts seem to answer in the negative."—*British Medical Journal.*

Says Dr. T. K. Chambers, "Alcohol is primarily and essentially a lessener of the power of the nervous system."

"As their general action is quickly to reduce animal heat, I can-

not see how they can supply animal force. I see clearly how they reduce animal power, and can show a reason for using them to stop physical pain; but that they give strength, that they supply material for the construction of fine tissue, or throw force into tissues supplied by other material, *must be an error as solemn as it is wide-spread.*" "To resort for force to alcohol is to my mind equivalent to the act of searching for the sun in subterranean gloom until all is night."—*Dr. B. W. Richardson.*

Is Alcohol Useful as a Stimulant?—If by a stimulant we are to understand something which imparts force to the body when weakened by disease, then it is evident that alcohol can be of no service in this direction; for, as already shown, it is incapable of supplying force, undergoing no change in the body. All force arises from changes in matter. The forces manifested by the living system are the result of vital changes occurring in its tissues.

If by a stimulant is meant something which *excites* nervous action, which calls out the manifestation of force, then alcohol is certainly a stimulant. And it is in this sense only that it is a stimulant. The lash is a stimulant to a tired horse. It does not increase his force, or make him any less tired. It only compels him to use a little more of his already depleted strength. A goad, a spur, a red-hot iron, would have the same effect. So with alcohol. It arouses the vital instincts by its presence in contact with some of the tissues, and, in obedience to the law of self-preservation, the vital organs are excited to increased action for the purpose of expelling the poison. This increased activity is what is called stimulation. Can it benefit a person already weak with overlabor? Says Dr. Edmunds, "A stimulant is that which gets strength out of a man." Such a process could not be very beneficial to a person already debilitated.

But a weary man *feels* better after taking wine; why is that the case? Alcohol diminishes sensibility, as chloroform does. It is a narcotic. The weary man feels better after taking wine, because he does not know that he is weary, that his tissues need repair. If he continues to labor, he continues to wear out his tissues, and increases the necessity for rest, even though he may not know it. When the narcotizing influence of the alcohol is removed, he will be made painfully conscious of the fact by a degree of prostration far greater than he would have suffered if he had taken no alcohol.

So with the sick. If a man is debilitated by disease, by a long-

continued fever, for example, his system is weary with the task of expelling impurities from the body. Now if alcohol is administered, it is expelled as the other impurities have been. It renders the exhausted organs no aid; it imparts no force; it simply imposes an additional task. Such aid is surely not desirable. Who would think of relieving an overburdened horse by adding another burden to his load? No sensible man, certainly. If fever patients recover after taking great quantities of wine and brandy, it is *in spite* of the alcohol, and not by the aid of it; for it has been proved in hundreds of instances that fever patients do far better without brandy than with it.

Twenty years ago, when a man had fever he was puked, purged, bled, and salivated, under the notion that he had too much vitality,—too much life,—some of which must be got out of him. The plan of abstracting vitality was so successful that thousands of fever patients were killed who might have lived half a century if they had been so fortunate as to have had for a doctor only an old woman, or a harmless homeopathist.

In later times there has been a most remarkable revolution in the treatment of fevers. Calomel, emetics, purgatives, and the lancet are no longer employed in treating fevers. Instead of depleting their patients, or robbing them of their vitality, by the barbarous methods of olden times, many physicians have adopted the theory that in fever the patient has too little vitality, and so they attempt to increase his vital force by potations of brandy, wine, and other alcoholic liquors.

Of course, this practice is founded upon the theory that alcohol supplies force; but we have already proved that alcohol does not supply force to the body, but that it exhausts, abstracts, and paralyzes. This, then, cannot be the proper agent to employ when an addition of force is required.

Says Dr. James Edmunds, of England, "I believe, in cases of sickness, the last thing you want is to disguise the symptoms, to merely fool the patient; that if alcohol were a stimulant, that is not the sort of thing you would want to give to a man when exhausted from fever. . . . . If your patient is exhausted by any serious disease, surely it would be the more rational thing to let him rest quietly, to save his strength, and in every possible way to take care to give him such food as will be easily absorbed through the digestive apparatus, and keep the ebbing life in the man."

The following is the opinion of Dr. Richardson on this subject:—

"It is assumed by most persons that alcohol gives strength, and we hear feeble persons saying daily that they are being 'kept up by stimulants.' This means actually that they are being kept down; but the sensation they derive from the immediate action of the stimulant deceives them and leads them to attribute passing good to what, in the large majority of cases, is persistent evil. The evidence is all-perfect that alcohol gives no potential power to brain or muscle. During the first stage of its action it may enable a wearied or feeble organism to do brisk work for a short time; it may make the mind briefly brilliant; it may excite muscles to quick action; but it does nothing substantially, and fills up nothing it has destroyed, as it leads to destruction. A fire makes a brilliant sight, but leaves a desolation. It is the same with alcohol."

Does Alcohol Prevent Waste?—So said Prof. Liebig, who supposed that alcohol might serve as a substitute for the tissues in maintaining the combustion necessary to produce heat. But Prof. Liebig was mistaken. Dr. Smith, of England, proved that alcoholic drinks increase waste. It is useless, then, to give alcohol to the sick for the purpose of preventing the wasting of the body, for it will only accelerate the undesirable process.

Will Alcohol Prevent Consumption?—The notion has lately become prevalent that alcohol will, in some mysterious manner, check the ravages of that dread disease, consumption. It might almost be said that in our large cities, in the practice of regular physicians, few consumptives die sober, so fashionable has this remedy become.

The evidences upon which the utility of the drug in this disease is based are quite too inconclusive to amount to anything like demonstration. In those cases in which recovery has taken place under the use of alcohol, the improvement can be attributed to other far more probable causes than alcohol, as improvement in sanitary or hygienic surroundings or habits.

But the most conclusive evidence against the curative virtues of alcohol in this disease is found in the fact pointed out by Dr. B. W. Richardson, of London, that *alcohol is itself a* CAUSE *of consumption.* There is no evidence that spirit-drinkers are as a class less subject to consumption than abstainers, while it is certain that their mortality is much greater. Dr. Richardson has recently pointed out that the most fatal form of consumption known is produced by alcohol. According

to his observations, about two per cent of deaths by consumption are from this cause.

The Medicinal Use of Alcohol Leads to Drunkenness.—Thousands of victims of intemperance have acquired their appetite for the fatal drug from a physician's prescription. The doctor prescribed it as a tonic. The patient continued to feel the need of a tonic, and so he continued taking his dram as a medicine, a tonic, until he finally found, when too late, that he had become a confirmed inebriate.

Hundreds of reformed drunkards who had been induced to sign the pledge, and who had kept their resolution for years, have fallen back into the gutter again through the careless administration of alcohol by the family physician, and have thus been hopelessly lost to themselves and to society. We might present the touching details of many such cases; but all have been familiar with instances of the kind, and we will not present them here.

In addition to the alcohol prescribed by regular physicians, there is a still greater quantity sold and used under the name of bitters, which always consist of a filthy mixture of poisonous drugs with poor whisky. Not one of them is free from alcohol. This statement is true, notwithstanding the false asseverations of the manufacturers to the contrary. Even "temperance bitters" are no better than the rest. Some of these "bitters" contain more alcohol than the strongest liquors. By these infernal compounds, thousands of unsuspecting human beings have been lured down to death and ruin. The popular theory that alcohol is a good medicine, helps to inspire confidence in them, and so becomes in a measure responsible for the results.

The Medical Use of Alcohol an Ally of Intemperance.—The doctor gives a man alcohol because he is sick or weak. The moderate drinker takes it for the same reason. The drunkard prescribes his own "poison" because he feels uncomfortable—sick. The moderate drinker takes a glass of wine to give a "lively play of the imagination." When its influence is gone, his intellect is dull, his imagination clouded. He takes another glass to "cure" the difficulty, not considering that the remedy is the very thing that is making him ill. The drunkard wakes up after a night's debauch with an aching head, enervated muscles, and trembling nerves. He takes a glass of rum to cure his bad feelings, and at once feels better. Is not rum a good medicine for him? He thinks it is, and he has the doctors on his side, for the principle is the same whether the patient is suffering from fe-

ver debility or whisky debility,—whisky cures in each case, and in the same way. Why has not the drunkard as good an excuse for curing his weakness and bad feelings by alcohol as any other person?

Alcohol in Delirium Tremens.—Alcohol is the acknowledged cause of delirium tremens, and yet it has been long considered an essential remedy in the treatment of the very disease it had produced. While this practice would seem to be most ludicrously absurd, it has, nevertheless, been wholly consistent with the theory that alcohol supplies nervous force; for what condition can be found in which the evidences of loss of nerve power and tone are more distinct than in this disease? Practically, however, the use of alcohol in this disease has been a most convincing demonstration of the fact that alcohol does not supply nerve force; for a great proportion of the patients treated with it have died.

The most observing physicians have already abandoned the use of alcohol in delirium tremens, as we hope they will soon do in many other diseases. Here are a few testimonies:—

"I have come to the conclusion that the use of spirits in the case of delirium tremens does nothing but injure the patient, and probably hastens his death. I now, without the slightest hesitation, in every case should immediately stop the spirit, and I find that very few cases of delirium tremens that I have are fatal."—*Dr. James Edmunds.*

"If you follow the old treatment, you will lose half your cases. If you follow the treatment I give you, you will save nearly all. In the hospitals of Edinburgh, the expectant treatment is found to save nearly all patients. They used to lose nearly all."—*Prof. Palmer, of Michigan University.*

Dr. Palmer recommended the expectant treatment. He also stated that, in Edinburgh, instead of narcotics the patient is given a glass of water with the assurance that it will make him sleep, which it usually does.

Alcohol for Mothers.—It has become a notorious fact that the use of stimulants by women is increasing very rapidly, and the evil has already acquired alarming proportions. It has doubtless very largely arisen from the practice of physicians and nurses of recommending wine and beer to nursing mothers. The habit thus acquired is continued.

But the mothers are not the only victims. A large share of the alcohol finds its way out of the system into the milk, and in this way

delicate babes are kept in a state of semi-intoxication from birth until they are weaned. A mother finds her child nervous and fretful. She takes a glass of ale an hour or two before nursing the infant, and is pleased to find that he becomes quiet. She little dreams that his quietude is only the stupid narcotism of alcohol poisoning; yet such is the truth. Every one knows that a dose of castor-oil given to a nursing mother will affect the child as promptly as the mother. The same is true of alcohol; but the delicate organization of the infant is far more susceptible to its poisonous influence than is the mother's system. Dr. James Edmunds says that a large majority of English ladies use stout while nursing, so that their infants "are never sober from the earliest period of their existence until they have been weaned."

Beginning life under such a regimen, is it any wonder that so large a number of young men, and young women also, develop into drunkards? Such a result is only the fruit of the seeds sown in earliest infancy. The ancient Romans were so well aware of this fact that the use of alcoholic drinks was by law prohibited to a Roman mother while an infant was dependent upon her for support.

What Does Experience Prove?—The testimony of many eminent physicians is that the use of alcohol as a supporter of vitality, a tonic, or a stimulant, is wholly unnecessary.

In London, there is a temperance hospital under the charge of Dr. James Edmunds, who delivered a very interesting series of lectures on this subject in New York City a year or two since. In this hospital, all alcoholic medicines are excluded "without incurring any risk or delay in recovery, and with advantage rather than detriment." The death rate, from the first establishment of the hospital, has been but six per cent, a rate far below that of other hospitals. Of more than three hundred surgical cases, which are generally supposed to especially demand alcohol, not a single one proved fatal without it.

Other hospitals are following the example of the temperance hospital, and with equally favorable results.

Says Prof. Miller, M. D., of Scotland, "Alcohol cures nothing."

Dr. Higginbottom said before the British Medical Society, "I have never known a disease cured by alcohol."

Dr. Johnson, an English physician, says that alcoholic liquors are, "as medicines, wholly unnecessary."

A few years ago, two thousand English physicians publicly expressed their disapproval of the use of alcohol as a medicine.

In London alone, three hundred physicians signed a petition for the suppression of the liquor traffic, "alcoholic drink being, in their opinion, wholly unnecessary for medical purposes."

Prof. L. P. Yandell, a distinguished Southern physician, in a letter from Europe to the Louisville *Medical News*, wrote as follows of the opinion of English physicians respecting alcohol:—

"After a very extended intercourse with the profession here, I am inclined to believe that a majority of the strong men consider alcohol harmful as a beverage, and a very large number are very doubtful of its efficacy in disease. Such are my own views of alcohol."

At a recent meeting of the British Medical Temperance Association, at which many members of the British Medical Association were present, Dr. Ernest Hart, editor of the *British Medical Journal*, stated that "the medical profession were nearly all agreed that alcohol was neither a food nor a tonic."

At the present time there exists in England an organization known as the British Medical Temperance Association, which comprises in its ranks many of the ablest medical men in Great Britain.

We have treated several hundred cases of all forms of acute and chronic diseases, and have found very little occasion for the use of alcohol. Of over sixty cases of typhoid fever treated in one epidemic, not more than one or two received alcohol or stimulant of any kind, yet all recovered, without any unpleasant after-effects, and without the prolonged convalescence so common after this disease.

If brandy, or alcohol in any form, is ever admissible, it is only when its poisonous effects as an irritant may be desirable, just as a dash of cold water, the application of a hot poker to the spine, or of ammonia to the nostrils, may each under some possible circumstances be serviceable in arousing the vital energies from a sudden collapse, and thus preventing death.

ARGUMENTS IN FAVOR OF ALCOHOL CONSIDERED.

In order to call attention to some other facts of importance, necessarily omitted in the consideration of the subject thus far, we will devote a few pages to an examination of some of the principal arguments urged in favor of the use of alcoholic liquors.

1. Alcohol Is Food.—The aristocratic toper, who wishes to give an air of respectability to his vice, will claim that alcohol is a food. He will cite, in proof, instances in which persons have lived for weeks

by the aid of no other nutriment, taking nothing but alcohol and water. This semblance of argument scarcely needs exposure; for the most that can be claimed is that it proves merely that persons have lived several weeks while taking only alcohol and water. The fact that individuals have in several instances been known to live from thirty to sixty days while taking only water, shows conclusively that those persons who lived a shorter time on brandy and water lived in spite of the alcohol instead of by the aid of it. A conclusive evidence that alcohol is not a food is found in the fact that when taken into the system it undergoes no change. It is alcohol in the still, alcohol in the stomach, alcohol in the blood, alcohol in the brain, in the liver, in all the tissues, and alcohol in the breath, in the perspiration, and in all the excretions. In short, alcohol is not used in the body, but leaves it, as it enters, a rank poison.

"I can no more accept them as food than I can chloroform or ether."—*Richardson.*

2. Alcoholic Beverages Preserve the Body.—Alcohol is a powerful antiseptic. An apple or the body of an animal placed in the fluid, cannot undergo decomposition. From this, some lovers of the article are very ready to infer that the use of alcohol will prevent decomposition of the tissues of the body, and thus tend to its preservation. A greater fallacy could not be conceived. Corrosive sublimate, blue vitriol, copperas, and carbolic acid are excellent antiseptics; but who would think of taking any of these articles for the purpose of prolonging life?

But if alcohol did really hinder the destruction of the tissues, so as to prevent the natural process of disintegration, it would still be very injurious; for all the processes of life are dependent upon destructive changes of tissue; and hence, anything which would hinder this process would hinder vital action, would interfere with the life processes which are essential to the manifestation of life.

But it can be shown that the evidence upon which the scientific advocates of the use of alcohol base their arguments is quite unsatisfactory. They claim to find that the body wastes less while a person is using alcohol than when abstaining, the other conditions being the same. Hence, they tell us alcohol prevents vital changes, and so saves the body from wearing out. With this view they recommend the use of liquor to those who are obliged to undergo any hardship, or to perform any severe physical labor.

Let us examine this argument. It is found that the urine and other excretions contain less of the worn-out material of the tissues when a person is using alcohol than when he is abstaining. From this alone it is concluded that alcohol prevents the wearing out or disintegration of tissue,—a most astonishing conclusion. No one but a man stoutly prejudiced in favor of alcohol would think of forming such a conclusion. A far more rational deduction from the premises would be that the presence of alcohol in the system *prevents* the excretory organs from eliminating from the body the *dead* and *poisonous products* which result from the wearing out of the tissues. This conclusion would seem to be far more reasonable, since alcohol itself is a poison which is thrown out by the same organs whose proper function it is to remove the debris of the tissues. These organs cannot perform more than a certain amount of labor. If most of their activity is expended in eliminating alcohol, of course they can perform less of their proper labor, and so the dead products of disorganization will be left to accumulate in the body and produce a deceptive increase of weight. It is by this means that the drunkard often acquires a bloated appearance. Every one knows that such an accumulation of tissue is not healthy flesh; yet it is of the same character as that which leads some prejudiced scientists to pronounce in favor of alcoholic beverages as a preventive of waste.

Surely, such science must be of the kind referred to by the apostle Paul when he spoke of "science falsely so-called."

If it were any recommendation to alcohol that it diminishes the waste of the tissues, or is supposed to do so, this would be an equally good recommendation for the habitual use of nitric acid and mercury, which Dr. Fyfe of Edinburgh has shown to have the same effect.

Again, as already observed elsewhere, Dr. E. Smith and others have proven that alcohol does not diminish the waste of the body, but rather increases it, as is shown by the increased amount of carbonic acid thrown off by the lungs, although the amount of urea eliminated by the kidneys may be less. This, of course, completely upsets the argument used by those who maintain that alcohol is a sort of negative food.

3. Alcohol Strengthens the Muscles.—The laborer, the traveler, and the soldier use alcohol under the delusion that it strengthens. When fatigued, the laborer takes a glass of grog and *feels* better, or thinks he does. He imagines himself stronger. His increased strength, however, is wholly a matter of the imagination.

The use of alcohol makes a man *feel* stronger,—makes him believe that he can do more work, endure more fatigue and hardship, and withstand a greater degree of cold than he could do without it; but when an actual trial is made, it soon becomes apparent that the ability is lacking. Feeling and doing are two wholly different things; and here is where alcohol is so deceptive. It is a narcotic, and paralyzes the nerves so that they lose their normal sensibility. The weary man takes a glass of brandy, and continues his toil,—not because he has been strengthened, not because his vital forces have been re-inforced, but because he no longer *knows* that he is tired. Weariness is an appeal for rest on the part of the tissues. They have become worn and broken by action, and they require time to repair themselves. Alcohol has the same effect upon the nerves which control the building up of the body that chloroform has upon the nerves of general sensibility, and it allays the sense of weariness in the same way that chloroform allays pain during a surgical operation,—by paralysis. A person whose hand has been rendered insensible to pain by intense cold may place his fingers in the fire without suffering at the time, but he is not thereby prevented from being burned, any more than though his sensibility was unimpaired; and the effects of the destructive action of heat will ultimately become painfully apparent.

In experiments made by the writer and reported in a paper read before the American Medical Temperance Association, it was shown that the total strength of a healthy young man was diminished 33⅓ per cent as the result of taking four ounces of whisky. The total falling off was more than 900 pounds, and his actual strength was diminished in a notable degree. It was noticed that the loss of strength in the legs was much greater in proportion than in other parts of the body.

Numerous experiments have shown that alcohol decreases muscular strength. Says Dr. Brinton, "The smallest quantity takes somewhat from the strength of the muscles." Says Dr. Edmunds, of London, "A stimulant is that which gets strength out of a man."

Said Prof. Willard Parker, M. D., of New York, "It has been proved that when taken into the system it diminishes the temperature, lessens the strength, and by about *forty per cent* shortens human life."

4. Alcohol Warms the Body.—The sensation of warmth produced by taking a glass of wine or brandy is delusive. The circula-

tion is unbalanced, and for a few moments there is a seeming increase of heat; but the thermometer shows that the temperature is lessened. Says Dr. Parkes, the eminent English sanitarian, "All observers condemn the use of spirits, and even of wine or beer, as a preventive against cold." The names of Dr. King, Dr. Kane, Captain Kennedy, and Dr. Hayes, may be cited as holding to this opinion. In the last expedition in search of Sir John Franklin, the whole crew were teetotalers.

Prof. Janeway, M. D., professor of materia medica in Bellevue Medical College, stated in a lecture before his class that alcohol does not assist those who use it to endure cold. In proof of the assertion, he related the following incident, which was given to him by the first gentleman mentioned in the account:—

A gentleman was appointed by the government to go on a survey in the Eastern States in the depth of a severe winter. He chose for his assistants men who were total abstainers. At the same time, another party set out upon the same business, the members of which were addicted to the use of whisky. Only one of the first party gave out, while nearly every one of the whisky-drinkers succumbed to the influence of cold.

"Plenty of food, and sound digestion, are the best sources of heat." "I am quite satisfied that spirituous liquors, though they give a temporary stimulus, diminish the power of resisting cold."—*Sir John Richardson.*

"When a continuance of exertion or endurance is called for, spirit does harm; for you are colder or more fatigued a quarter of an hour after [taking] it than you would have been without it."—*Dr. Hooker, physician of the Arctic expedition under Sir John Ross.*

Prof. Miller states that the Russian military authorities "interdict its use absolutely in the army, *when troops are about to move under extreme cold;* part of the duty of the corporals being to smell carefully the breath of each man on the morning parade, and to turn back from the march those who have indulged in spirits, it having been found that such men are peculiarly subject to be frost-bitten and otherwise injured."

"The Hudson Bay Company have for many years entirely excluded spirits from the fur countries to the north, over which they have exclusive control, 'to the great improvement,' as Sir John Richardson states, 'of the health and morals of their Canadian servants, and of the Indian tribes.'"—*Dr. Carpenter.*

5. Alcohol Protects against Excessive Heat.—The advocates of drinking, like the man in the fable, "blow both hot and cold" in their arguments. They love the beverage, and so it must be useful in some way. Dr. Parkes says on this point, "Not only is heat less well borne, but insolation (sunstroke) is predisposed to." "The common notion that some form of alcoholic beverage is necessary in tropical climates is, I firmly believe, a mischievous delusion." His statements are supported by all the best authorities on tropical diseases, Dr. Carpenter and others.

Said Prof. John Bell, M. D., an eminent medical author, "They who drink nothing but water have been found to be more enduring of fatigue and great labor, and of hardships and exposures in every extreme of climate and season, than they who use alcoholic beverages. The comparisons have been made in almost every conceivable manner (seldom, it is true, designedly), and with the result just announced. Men who have to carry on laborious occupations at a high temperature, as in iron-foundries, gas-works, sugar-houses, etc., find that the use of alcoholic liquors, while they are so employed, is decidedly prejudicial to them. Of twelve workmen—smiths in the dock-yard at Portsmouth, England—who tried the experiment for a week, six drank nothing but water, the other six took the usual allowance of beer. After the first day, the water-drinkers complained less of fatigue than the others, and after each successive day the advantage was on the side of the abstainers, until the conclusion of the week, when the water-drinkers declared that they never felt so fresh in their lives as they had done during this period."

According to Sir James McGregor, quoted by Dr. Bell, the Anglo-Indian army was never so healthy as when in Upper Egypt, where no ardent spirits were supplied to the troops on account of the difficulties of transportation. The soldiers were often exercised in the sun, the heat of which was so great that the thermometer indicated 118° F. in the shade.

It has been observed that among English soldiers in India those who are strict teetotalers endure long marches under exposure to a tropical sun much better than those addicted to the use of liquor.

During the hot season in this country it has been found that by far the larger share of all the cases of sun-stroke which occur are of intemperate persons. Total abstainers have little to fear from sun-stroke.

6. Alcohol Stimulates.—So, then, do opium, strychnia, and prussic acid stimulate. What is a stimulant? "Stimulant" is only another

name for poison. Stimulation means poisoning. When alcohol, or any other one of a hundred poisons which might be mentioned, is taken into the body, every vital organ sets to work to get it out. The liver filters it out in the bile; the lungs pour out volumes of it in the form of a vapor, making a drunkard's breath smell like a distillery; the skin pours it out as sweat; the kidneys do their part in expelling the vile drug; and all the time the heart pumps away with violence to hasten the departure of the intruder. This great commotion in the vital economy is called "stimulation."

These are the first effects of alcohol, or the effects of small doses,—such effects as the moderate drinker feels. The later effects, and those which result from larger doses, are depressing. The excitement is followed by a corresponding degree of depression, or partial paralysis, since the drug supplies no force in return for that which it expends. Many of the ablest physicians pronounce alcohol a narcotic.

If alcohol is a stimulant, that fact is one of the best arguments against its use. Says Sir B. Brodie, "Stimulants do not create nerve power."

7. Alcoholic Drinks Protect the System against Disease.—One finds an excuse for the use of liquor in small or great quantities in the theory that it will fortify his system against the ravages of small-pox or cholera. Another takes liberal doses of brandy to "keep off the chills." Another keeps his system saturated with alcohol so that he will not take cold. Any one of these diseases, or almost any other, would be infinitely less harmful than alcohol itself, even if the opinion were true, that alcohol is a preventive; but alcohol is not a preventive of disease, according to the experience of the most reliable observers. Dr. Parkes, Sir John Hall, Inspector General of the English army, Dr. Carpenter, Dr. Mann, Henry Martin, and others of equal eminence, all concur in this opinion.

Indeed, the most indubitable evidence can be cited to prove that alcohol is directly the cause of a vast amount of disease, instead of being, as many suppose, a preventive. If alcohol were a preventive of disease, then those who use it ought to be the most healthy; but we find the contrary to be the case. The liquor-drinker, instead of living longer than the teetotaler, as he ought to do if this theory were true, lives, on an average, after reaching adult age, only one-fifth as long as the abstainer, as shown by life-insurance statistics.

8. Alcohol Aids Digestion.—The moderate drinker takes his morning dram to fortify his stomach for the reception of his breakfast.

Immediately after breakfast he must have another glass to assist digestion. But how does alcohol assist digestion? Not by dissolving the food, for its effect is to harden tissues. It does not render the gastric juice more efficient, for it destroys it and causes its active element, pepsin, to be deposited as a white powder. In dogs to which alcohol was given with food, it was found that the process of digestion had not begun, twelve hours after eating. The stomach is obliged to remove all the alcohol before digestion can begin. This, then, is a monstrous fallacy.

9. Alcohol Is Made from Grain.—"But," says one, "alcohol is made from grain, and if it is so very bad, why should not the grain be injurious also? There is a little poison in everything, any way."

Alcohol is made *from* grain, but it is not found *in* it. Smoke is made from wood, yet there is no smoke *in* wood; it is made by the destruction of the latter. Alcohol is made by the destruction of fruits and grains.

It is an absurd popular notion that there is, necessarily, poison in everything. In these days of wholesale adulteration it is often difficult to obtain food unmixed with poisonous products; but nature does not serve us so badly. Poison is not essential to life.

10. Whisky Does not Hurt Me.—The opium smoker, the absinthe taker, the arsenic eater, all use the same argument, yet each falls a victim to his vice. You do not know what alcohol is doing for you. "Wine is a mocker [deceiver]." You cannot see its depredations. Your blunted sensibilities cannot feel its ravages. Your friends see its influence. Your wife notes it and mourns over it. You can yourself see it in others. Are your tissues different from those of every other man? Are they made of iron that they cannot be destroyed? Is the alcohol you drink different from all other alcohol? No; your good sense tells you, No. Then reform before it is too late.

11. Pure Liquor Is not Bad.—"If we only had such pure liquor as they used to make, it would not be so very bad," says one. "Only take a little of my wine; I made it myself, and it cannot hurt any one," says the good housewife.

These are two mischievous errors. Alcohol is the worst poison found in liquor. No drug added by adulteration is so bad as the fiery liquid itself. Pure liquor is simply pure poison. Alcohol is always the same, and its effects are always identical, whether it is found in the whisky barrel, or the cider barrel; in rum, brandy, lager-beer,

home-made wine, or "temperance bitters." Alcohol is the horrid fiend we are fighting, no matter under what guise it comes.

12. Moderate Drinking not Harmful.—Every man, even the drunkard himself, admits that liquor in excess is injurious; but a large and very respectable class claim that it is an evil only in excess, and is a harmless luxury, if nothing more, in moderate quantities. This, too, is an error which has proved fatal to thousands. A small dram soon grows to be a large one; claret is exchanged for grog or toddy; and so, by degrees, the moderate drinker becomes a drunkard, the first "small drop" engendering a love for succeeding larger doses.

It is not necessary that a man should be dead drunk to be intoxicated. Intoxication is derived from a Latin word meaning poison, and means, literally, a condition of poisoning. Alcohol is a poison. If a man takes it into his system, he is poisoned, or intoxicated, in proportion to the amount taken.

Moderate drinking produces a disease well known to physicians as *chronic alcoholism.* It is especially dangerous to the old, as it is one of the most powerful predisposing and exciting causes of apoplexy, as well as of numerous other diseases.

13. Doctors Recommend Wine and Brandy.—It is a lamentable fact that a large class of physicians use alcohol in their practice in a most reckless manner. The result is seen in hundreds of drunken sots who haunt saloons and groggeries. That the free use of alcohol is wholly unnecessary has been already shown.

14. Scientific Men Recommend the Use of Alcohol.—This, too, is a deplorable fact; for it is a sad spectacle when science stoops to cater to the demands of morbid appetites and vices. It is a significant fact that those scientific authorities who recommend the use of alcohol are themselves addicted to its use. It is not an unjust inference that their judgment, in this case, is biased by their appetite. But there are a great many of the most eminent scientists who are the strongest advocates of total abstinence. Among them are Dr. W. B. Carpenter, Dr. Parkes, Dr. Richardson, Dr. Parker, Dr. N. S. Davis, and Sir John Hall, with many others.

"If alcohol were unknown, half the sin and a large part of the poverty and unhappiness would disappear from the world."—*Dr. Parkes, Practical Hygiene,* p. 242.

"There is, of course, no doubt that wine is unnecessary as an article of diet."—*Ib.*, p. 241.

A long list of names of eminent scientists and physicians might be presented against alcohol as a beverage, and a very respectable list against its common use as a medicine. There is no doubt that many popular medical works which have recommended alcohol as a remedy for almost every ill, have done much toward creating an incorrect popular opinion on this subject; and it is the duty of every intelligent physician, as well as all others who are informed on the subject, to do what he can to correct this pernicious error.

15. All Nations Use Stimulants.—Some will argue from the fact that the use of liquor of some kind is almost universal, that the appetite for it is a natural one. Admitting that inheritance may have made it such, the argument is still worthless; for what nation is there among whom lying, stealing, and other crimes and vices do not also exist? If intemperance is a universal evil, the fact should be most deeply deplored, instead of being made an excuse for perpetuating the vice.

But intemperance is not universal. Until taught the use of alcohol by white men, the North American Indians were wholly unacquainted with the fiery beverage which they have appropriately named "fire water." And the introduction of liquor among these savages has done more toward their extermination than any other cause. Many other barbarous tribes are still in happy ignorance of this enticing poison.

Again, the appetite for fermented drinks is not a natural one. Offer an infant brandy; it is repulsed at once, as it should be. No beast naturally loves alcohol, though there are several animals which, like man, may be taught to love liquor and demand it as imperiously as any old toper. The hog is an animal of this kind. The resemblance of man to this animal, in this respect, is not flattering, at least.

Dr. Floyer, a writer in the early portion of last century, relates the case of a brewer's dog which learned to like beer and ale, and formed the habit of licking ale and yeast from the brewer's trough. After a few years he began to suffer greatly from gout, his feet and limbs swelling prodigiously. The drunken dog finally died, as thousands of other drunkards have, of dropsy.

Even though an artificial appetite has in some cases been created, this fact does not change the relation of alcohol to the system in the least. Alcohol is a poison still; and the system will treat it as such, in spite of an inherited or an acquired appetite for it.

16. The Use and Sale of Alcoholic Liquors Is a Source of Great Revenue to the Government.—Says the liquor-dealer, "The manufacture and sale of alcoholic drinks gives employment to more than 500,000 men. It furnishes a market for more than 40,000,000 bushels of grain each year, and pays to the government an annual tax of $60,000,000, or about two-fifths of the whole revenue of the country."

Such arguments are actually urged by the dram-sellers and their infatuated customers. What a damage to the government would be the loss of $60,000,000 of revenue! and what a pity that 500,000 poor laborers should be thrown out of employment! Ah, yes; and what a pity that 40,000,000 bushels of grain, equivalent to 600,000,000 four-pound loaves of bread, should be wasted—worse than wasted, manufactured into poison! The same liquor which brings to the government a revenue of $60,000,000 makes 800,000 paupers, who require for their maintenance $100,000,000. There is very little profit in this, surely. The cost of crime resulting from drink is still greater. The expense of caring for 30,000 idiots and lunatics must also be charged to alcohol. Where, then, are the profits? We have said nothing of the loss resulting from the unproductive labor of those employed by the liquor business, or from idleness, disease, and death occasioned by drink, which aggregate an enormous sum.

17. The Moderate Use of Wine is Necessary to Maintain Nervous Activity in Old Age.—Many, even of those who profess to be instructors of the people in the laws of health, advocate the use of wine in old age, on the ground that age renders the system somewhat sluggish in its activities, and hence a little stimulus is needed to maintain its functions, and especially nervous activity.

A consideration of this argument will show that the use of alcohol is not only unnecessary in old age, but absolutely hazardous. Why are the bodily functions less active in old age than in youth? Why is the mind less brilliant? Because the organs of the body have become worn and disabled by long usage and imperfect repair. The tissues are not kept intact by assimilation. The reason why they are less active, then, is that they are less qualified to act. They are incapable of that vigorous action which they sustained in youth and middle age.

This decreased activity is an admirable provision of nature for the prolongation of life to the utmost limit. The waste of tissue depends upon its activity; the more action, the more waste and wear, the sooner

worn out. Using alcohol produces an increased activity, but does not increase the capability of the system to sustain action. In other words, it tears down tissue, but does not build it up. It interferes with the repair of tissues. The increased vigor seemingly imparted by alcohol, therefore, is *dangerous*, rather than desirable. If alcohol enables a man to live faster, it shortens his existence by so doing.

Again, alcohol, even in moderate quantities, produces a peculiar degeneration of the walls of the blood-vessels, by which they become weakened, the muscular tissue composing the small vessels being replaced by particles of fat or carbonate of lime. This kind of degeneration is also a frequent incident of old age, even in those who are not spirit-drinkers, and is especially liable to occur in the small arteries of the brain. The use of alcohol not only facilitates this morbid process, but adds to the danger which is always present with it under the most favorable circumstances. When the arteries are thus weakened, a little extra supply of blood in the brain, a "rush of blood to the head," will often occasion rupture of some one of them, and apoplexy, with paralysis or immediate death, is the result. Alcohol, even in very small quantity, produces congestion of the brain, and thus renders an aged person doubly liable to death from apoplexy.

Are we not justified, then, in the position that alcohol is not only less desirable for the old than for the young, but is far more dangerous?

18. Alcohol Drives away Dull Care.—It will not be disputed that alcohol will dissipate cares, and pains, and sorrows. It makes a poor, homeless, friendless, poverty-stricken wretch feel as rich as a king. It makes the doomed murderer forget that he is soon to swing into eternity from the gallows. It makes the fallen outcast from society forget her shame. In short, it makes the user momentarily oblivious to all that is unpleasant in life.

But the release thus obtained is only for a moment, and it is inevitably succeeded by a return of the same old burden, rendered more galling and onerous by the stings of conscience and the goadings of remorse.

When a man's brain is so benumbed that he does not know his real condition, and loses sight of the realities of life, he is likewise incapable of appreciating any of those higher experiences and sentiments which constitute the highest enjoyments, the true realities of life. Only gross and sensual pleasures can be experienced when the mind is befogged by alcohol.

19. Alcohol Increases Mental Power.—Thousands of editors, lawyers, students, authors, and even clergymen, keep beside their midnight lamps a bottle of wine or brandy, and consider one as indispensable as the other. They imagine that with the frequent drams they quaff from that green bottle, they imbibe an increase of mental vigor. Thousands of lecturers, orators, and ministers sip a glass of sparkling poison just before they step upon the platform. The first imagines that alcohol is necessary to enliven his energies and sharpen his memory. The second relies upon alcohol to burnish his eloquence. The third depends upon the poisonous beverage to quicken his pious zeal, intensify his fervor, and lend him inspiration for the duties of his office.

We might justly dwell upon the absurdity of such practices, and well question the efficiency of a gospel shrouded with the fumes of alcohol; but we will only quote the words of Dr. James Edmunds, of London, Eng. He says, in speaking of the narcotic influence of alcohol:—

"That is the effect when a minister, who cannot preach without a glass of wine, has a glass in him. He finds his tongue will run on a little faster than his brains would be able to drive it if he had not got the alcohol in him. I submit to you broadly that if you take a man with a single glass of wine or spirits in him—if you test that man's mental accuracy and real debating power, you will find that the man who has spirit in him won't do it as well as the man who does not use it."

20. Alcohol Is a Good Medicine; and if it Will Make a Man Well when Sick, Will it not Keep him Well?—Alcohol may be usefully employed as a medicine under some circumstances, but there are eminent medical men who maintain that it may be safely and advantageously supplanted by other remedies which are not open to the objections which are justly urged against alcohol. And certainly no intelligent man would attempt to maintain that a substance which may be useful as a medicine is a safe or wholesome article for every-day use.

Dr. Gully pertinently remarks, "Healthy men, and men with chronic disease, do not require medicinal means every day after dinner. Yet there are men silly enough not only to take a nauseous pill daily *before* dinner, but this more pleasant but equally deleterious draught of physic [wine] after dinner. Strange infatuation!"

21. The Bible Sanctions the Use of Wine.—At the present time there is a powerful party who claim that the use of fermented, or in-

toxicating liquors is permitted and even sanctioned by the Bible. This party is headed by a few eminent scholars and clergymen, who are chiefly supported by a promiscuous throng of rich rumsellers, respectable moderate drinkers, and gutter drunkards.

The Bible has been quoted to sustain polygamy, slavery, and other evil institutions, as well as intemperance. Rightly understood, it supports none of these evils.

If it can be proven that the Bible favors the use of intoxicating drinks in any degree, then there is placed in the hands of the infidel a most powerful weapon with which to attack the authenticity and sacredness of the Scriptures. If, on the other hand, it can be shown that there is no such conflict between science and common sense, and inspiration, then the difficulty vanishes. A careful examination of the subject will convince any candid man that the support which the advocates of the use of liquor claim to derive from the Bible is wholly imaginary; and that the use which is made of the Scriptures in defense of intemperance is a most flagrant perversion of the language and import of inspiration.

Inspiration, true science, and sound common sense always agree. Any apparent conflict arises either from a misunderstanding of the meaning of the language employed, or from an imperfect knowledge of the scientific facts supposed to necessitate a disagreement. Science says, distinctly and unequivocally, All fermented drinks contain alcohol; alcohol is a poison *under all circumstances and in all doses.* The decision of science is sustained by that of reason; for common sense teaches that a substance with properties like those possessed by alcohol can be nothing else than poisonous. If it is true that the Bible teaches that alcohol—in the form of wine, or otherwise—is good and harmless, then it will be made to appear that inspiration is less wise than reason and science; that man, the creature, has outstripped the Creator in knowledge.

Such a conclusion, though correctly drawn from the premises, is too absurd for belief by one who has a modicum of faith in inspiration. and its manifest falsity would seem to be sufficient to fully expose the weakness of those who would make the Bible responsible for intemperance. The utter worthlessness of all arguments in favor of the use of alcoholic drinks, founded on the Bible, becomes still more apparent by a careful examination of the character of the wines mentioned in the Scriptures, and a consideration in detail of the texts which are claimed to be favorable to the use of alcoholic liquors.

Two Kinds of Wine Recognized in the Bible.—It is undoubtedly true that intoxicating liquors are mentioned in the Bible; and it is equally true that a kind of liquor or wine is recognized and often mentioned which is not intoxicating. Ancient historians preserve the same distinction, making frequent reference to intoxicating wine and its effects, and also to unintoxicating wine and its wholesome properties.

Unintoxicating Wine.—The intoxicating property of wine is due to the alcohol which it contains. Wine which contains no alcohol is unintoxicating. Alcohol is produced only by fermentation. Wine which has not undergone fermentation, then, is unintoxicating, since it contains no alcohol. All that is required to preserve wine free from alcohol, and thus from intoxicating properties, is to prevent fermentation. That the ancients were acquainted with several modes of preventing fermentation, is clearly shown by reference to history.

Intoxicating Wine.—As already stated, the intoxicating element of wine is alcohol, which is produced by the decomposition of sugar in the process of fermentation. Alcohol can be made from any juice which contains sugar. The ancients made intoxicating drinks from millet, dates, beans, palm juice, pears, figs, pomegranates, and other fruits, besides the grape. These liquors were known to the Jews, and are frequently referred to in the Scriptures. In Prov. 23:31, we have a striking reference to the fermentation of wine, as follows, according to Dr. Kitto's translation: "Look not thou upon the wine when it is turbid, when it giveth its bubble in the cup, when it moveth itself upright."

Scriptural Distinctions of Wines.—In the English version of the Scriptures, the distinctions made in the original are often obscured or wholly lost. This is especially true in the present instance. In the Hebrew, the language in which the Old Testament was written, different kinds of wine are indicated by different words, which are all rendered in the English translation by the one word wine. The principal words thus employed are יַיִן, *yayin*, שֵׁכָר, *shekar*, and תִּירוֹשׁ, *tirosh*.

Yayin, according to Biblical critics, refers to the juice of the grape in any form. It might be sweet or sour, fermented or unfermented. *Shekar*, or *shechar*, was the term applied to any sweet juice derived from any other source besides the grape. It is sometimes translated honey. It usually refers to the juice of the palm-tree or of its fruit, the date; and, like *yayin*, it included the fermented as well as the unfermented condition of the juice.

Tirosh was applied to the ripe fruit of the vine, and to the fresh juice of the grape before fermentation had begun. It is often translated "new wine."

In brief, then, *yayin* means fermented or unfermented wine or juice of grapes; *shekar* means fermented or unfermented wine or juice of the palm-tree, of dates or other sweet fruit. *Tirosh* means the sweet, unfermented juice of the grape, or new wine.

The Hebrews used the term *yayin* for wine made from grapes, in any of its stages, just as we apply the term cider to the fresh juice of the apple, or to the same juice after it has fermented or become "hard" by age. The Greek *οἶνος*, *oinos*, corresponds exactly with the Hebrew *yayin*.

The foregoing is certainly sufficient to show, beyond all chance for reasonable doubt, that there are two kinds of wine recognized in the Bible, one of which was sweet, unfermented, and unintoxicating, and the other fermented and intoxicating. The same term is often used for both kinds. If, then, we find the Bible in some instances speaking of wine in terms of commendation, and in others condemning it in the most forcible manner, would it not be most reasonable to suppose that in those cases in which wine is commended, the unfermented kind is referred to? and in those in which it is condemned, that which has undergone fermentation is meant? Any one who has confidence in the inspired character of the Scriptures will have no hesitancy in answering in the affirmative.

The Causes of Intemperance.—We have not space to devote to the subject sufficient to allow us to point out more than a few of the more powerful influences which in our opinion lead to the encouragement and perpetuation of one of the most potent evils of the age.

The most confirmed and irreclaimable drunkards are those who have inherited the appetite from ancestors who drank. There are many such. They are really less responsible for their condition than are those whose vices have entailed it upon them. Many instances are known in which the tendency to drink extended to the fifth generation from a drinking ancestor.

Probably this is the most active cause of the great and unabating increase of intemperance. Drunkards' sons become drunkards through inheritance, and transmit the propensity to their children, stamping it still more deeply upon their depraved organizations.

The use of alcohol in cookery has done not a little to cultivate a love

for the burning beverage. Wine and brandy sauces, and other preparations containing alcohol, early excite and form a love for alcoholic drink in children whose natural tastes would discard it at once. It is not at all uncommon to find alcohol taken in this form, even by people who consider themselves strict teetotalers.

Still another charge of far more universal application must be laid at the door of the cook, though the ignorance of the latter may cancel part of the responsibility. We refer to the general and excessive use of stimulating and irritating condiments in the preparation of food. Pepper, spices, and large quantities of salt and most other condiments, have an unmistakable influence in creating and exciting a love for stimulating foods and drinks, and thus ultimately lead toward intemperance.

The moderate use of liquor is the stepping-stone to greater excesses. All drunkards are at first moderate drinkers. Were there no moderate drinkers, there would soon be no drunkards. No man sets out in the drunkard's career with the expectation and determination of becoming an inebriate. It may be justly said that moderate drinkers are fresh recruits for the ranks of intemperance.

Tea and Coffee Encourage Drunkenness.—This statement will doubtless startle those who have been taught to believe that there is no evil in "the cup that cheers and not inebriates;" but we are prepared to show that the influence of the use of these poisons (for such they are) directly tends to encourage drinking stronger stimulants, though our present space will not allow us to enter into a discussion of the subject.

Tobacco-using and drunkenness go hand in hand. Nearly, if not quite, every drunkard chews or smokes. The great majority of drunkards became addicted to the use of tobacco first. Thus they learned to demand a stimulus of some kind. The feverish heat produced by tobacco required quenching, and liquor was resorted to. The white man gave the Indian rum, and the latter gave him tobacco in return. The exchange was a bad bargain for both. Either is bad enough alone; but rum and tobacco together are blasting the human race like a simoon from the heart of hell.

Thousands of men, and women too, have acquired an appetite for alcohol through a doctor's prescription. An unwise physician gave ale, beer, wine, or brandy, as a "tonic," "to improve digestion," "to strengthen the system," "to counteract debility," or for some similar reason. The patient thus acquired a love for the stimulation of alcohol, and soon came to regard it a necessity, and took the duty of prescribing

into his own hands. In a few years he became a drunken sot, and died a drunkard's death.

Ambition to excel on some particular occasion, or a desire to compel nature to forego rest beyond reasonable limits, has led many to take "an occasional drop," to their final ruin. The "fine exhilaration," the "lively play of the imagination," which accompanies slight stimulation, has led captive thousands of poets, authors, orators, statesmen, and even clergymen. Poverty, trouble, grief, disappointment, bad example, and other minor causes too numerous to mention, have their influence in the production of the omnipresent vice, intemperance.

The Cure of Intemperance.—The only cure for a drunkard is total abstinence. A person who has once been greatly addicted to the use of alcohol cannot use it in moderation. A person who is suffering from any of the functional diseases induced by alcohol must relinquish all stimulants if he would recover. Substitutes in the shape of tobacco, strong tea and coffee, even of soda-water, are dangerous. Tobacco produces a desire for liquor in one who has been accustomed to drink. Tea and coffee have similar effects, though in much less degree. The drinking of large quantities of fluid of any sort is injurious, as it produces a relaxed state of the stomach which causes a craving for stimulus. The "cinchona cure" of the appetite for liquor is worthless. The only plan which affords a way of escape from the haunting clamors of appetite in a person trying to reform is that proposed by Mr. Napier, who a few years ago read before a learned society in England a paper giving an account of the cure of a large number of cases of drunkenness by the adoption of a vegetarian diet. The great chemist, Prof. Liebig, observed, more than twenty years ago, that people who used only vegetable food did not take wine. Becoming acquainted with this fact, Mr. Napier made a practical application of it, with the result already stated. The following is a brief report of a few of his cases:—

"An analytical chemist, aged thirty-two, who was given to intemperance, on having his attention called to Liebig's statement, was induced to adopt a vegetarian diet, and before six weeks he was a total abstainer. A lady of independent means, a clergyman, a girl of nineteen, a man and his wife and sister (all over forty years of age), a bedridden gentleman (cured in thirty-six days), a captain in the merchant service, a half-pay officer, a clergyman and his wife, were all cured by a diet mainly farinaceous [vegetable]. Two sisters, members of a family noted for intemperance, were cured in about a year. A clerk who had

lost several situations because of intemperance was cured by vegetarianism and taken back at an increased salary. A governess aged forty, two military pensioners, a man of sixty, and three old sailors, were permanently cured in a few months."

Beans, peas, rice, and highly glutinous bread (graham bread), were observed to be of special value as articles of diet. This testimony is a powerful one in support of the position that the use of animal food is in some degree favorable to intemperance, and may perhaps be a remote cause of that vice in many cases. Both before and since seeing the report of Mr. Napier's experiments, personal observation has convinced us that the appetite for liquor is much less in a person addicted to its use while subsisting upon a vegetable diet than when using meat freely. We have also observed that those accustomed to use both alcohol and tobacco are rarely able to abandon one without the other. We might relate numerous cases which have occurred in our own practice in which we have succeeded in reforming inebriates when all other means had failed, by enforcing a farinaceous or vegetable diet. There can be no doubt but that the effect of stimulating food of all kinds is in the highest degree conducive to a love for stimulating drinks and for tobacco and other narcotics.

TOBACCO AND TOBACCO-USING.

Fig. 175. Nicotiana Tabacum.

Origin of the Habit.—Four centuries ago, tobacco was unknown in civilized lands, its use being confined to the few savages who inhabited the then undiscovered American continent.

In the month of November, 1492, when Columbus discovered the island of Cuba, he sent two sailors to explore it, who reported, when they returned, among many other strange and curious discoveries, that the natives carried with them lighted fire-brands, and puffed smoke from their mouths and noses, which they supposed to be the way the savages had of perfuming themselves. They afterward declared that they "saw the naked savages twist large leaves together, and smoke like devils."

To civilized human beings this was the first sight of the vile habit which has become so common that every city, town, and village is actually perfumed, or more properly fouled, with the vile stench of the poisonous weed. The impression made upon the unsophisticated Europeans was evidently not greatly in favor of the custom, since they compared the smoking Indians to devils.

Tobacco-using, together with the implements of its use and all the different modes of taking it, originated wholly with the heathen barbarians who roamed like wild beasts over the plains and through the dense forests of this continent four centuries ago. Civilized men have made no improvements or discoveries of any account in connection with its use; they have simply followed the example of those

naked savages whom the discoverers of America saw chewing, snuffing, and smoking "like devils" almost four hundred years ago. It is evident, then, that tobacco-using is a barbarous custom in the fullest sense. As to how savages learned the use of the weed, history does not give us any hint; but the fact that pipes and snuff-taking tubes are found in their most ancient burial mounds, which are often surmounted by huge trees that must have required many centuries for their growth, is evidence of its great antiquity.

Originating with the wild barbarians of America, the smoking habit was after some years introduced into Europe, and receiving the sanction of physicians who just at that time chiefly occupied themselves in searching for some new nauseous compound with which to experiment upon the lives of their patients, it was rapidly adopted.

It must not be supposed, however, that the world was conquered by this most pernicious and tyrannical of vices without a struggle. The good, the wise, and the prudent everywhere opposed. In most instances, kings and others in authority placed every obstacle in the way of its introduction and propagation, and even imposed severe penalties upon those who used the weed.

In Russia, the use of tobacco was prohibited under the penalty of the bastinado (a severe whipping) for the first offense, cutting off the nose for the second, and loss of life for the third. History gives account of several persons who were subjected to punishment for a second offense, their noses being amputated in public.

Pope Innocent XII. issued a bull of excommunication against all who used tobacco in any form in church. Many years afterward, however, the bull was revoked by Pope Benedict, who was himself an immoderate user of tobacco.

In Persia, the laws against tobacco-using were so stringent that the devotees of the weed were obliged to flee to the mountains, where they preferred to wander in exile among the rocks and caves with liberty to use their fascinating drug, rather than dwell in the peace and purity of home without it. In Switzerland, all users of the weed were punished as criminals. Punishment was inflicted upon a man in that country for smoking, so late as in the last century.

The opposition to the use of tobacco was not confined to the Old World. The governors of the American colonies followed the example of King James I. of England, in many instances, issuing edicts against its use, and placing every obstacle in the way of its introduction.

The old "blue laws" of Connecticut and of several other States contained restrictions of its use of a most strenuous character. In the city of Boston a law against smoking still exists; and less than a dozen years ago a workman was arrested on the public streets for the offense, and was fined in accordance with the law.

By degrees, the rulers who opposed the introduction and use of tobacco themselves became devotees of the weed, so that their opposition was withdrawn. Being thus without restraint, the evil habit rapidly spread throughout all civilized lands, enslaving alike all classes of people, from the ignorant peasant to the king upon the throne.

The history of tobacco-using furnishes a most striking illustration of the readiness of human nature to seize upon anything which promises gratification to the senses, no matter how disgusting, how pernicious, or how fatal in its ultimate consequences. The history of the world affords no other example of a vice which spread so rapidly and fastened itself so securely upon its victims.

The Nature of Tobacco.—Chemists, botanists, and physicians unite in pronouncing tobacco one of the most deadly poisons known. No other poison, with the exception of prussic acid, will cause death so quickly, only three or four minutes being required for a fatal dose to produce its full effect. It belongs to a class of plants known as the *volanaceæ*, which includes the most poisonous of all species of plants, among which are *henbane* and *belladonna*. There are more than forty distinct varieties of the plant, all of which possess the same general properties, though varying in the degree of poisonous character.

The active principle of tobacco, that is, that to which its narcotic and poisonous properties are due, is *nicotine*, a heavy, oily substance which may be separated from the dried leaf of the plant by distillation or infusion. The proportion of nicotine varies from two to eight per cent, Kentucky and Virginia tobacco usually containing six or seven per cent. A pound of tobacco contains, on an average, three hundred and eighty grains of this deadly poison, of which one-tenth of a grain will kill a dog in three minutes. A case is on record in which a man was killed in thirty seconds by this poison.

The poison contained in a single pound of tobacco is sufficient to kill three hundred men if taken in such a way as to secure its full effect. A single cigar contains poison enough to extinguish two human lives if taken at once.

The essential oil has been used for homicidal purposes. Nearly thirty years ago it was employed by the Count Bocarmé to murder his brother-in-law for the purpose of securing his property.

The Hottentots use the oil of tobacco to kill snakes, a single minute drop causing death as quickly as a lightning stroke. It is much used by gardeners and keepers of green-houses to destroy grubs and noxious insects.

A number of instances are recorded in which instant death has been produced by applying a little of the oil from the stem or bowl of an old pipe to a sore upon the head or face of a small child.

The poison of tobacco is so potent and violent in its action that even the external application of the moist leaves to the skin is sufficient to produce most serious symptoms. If a cigar be unrolled and the leaves composing it be applied over the stomach, great nausea will be produced in a very short time. This method has been used to induce vomiting. Cowardly soldiers have been known to place tobacco leaves under their arms just before a battle, for the purpose of producing sickness.

Some years ago a man was detected in attempting to smuggle a quantity of tobacco by placing the leaves next to his skin. The nearly fatal symptoms which followed led to the discovery of the smuggling.

If tobacco is poisonous when applied to the skin, it is doubly so when inhaled. The smoke of tobacco contains, in addition to *nicotine,* several other poisons, the chief of which are *pyridine, picoline, sulphureted hydrogen, carbon di-oxide, carbonous oxide,* and *prussic acid,* all of which are fatal poisons when received into the system in any other than the most minute quantities. Thus, it is not to nicotine alone that the evil effects of smoking are due, but to all of these poisons combined.

Birds, frogs, and other small animals die when exposed to the fumes of tobacco in a confined space.

Inhalation is the most speedy way of getting any volatile poison into the system. The reason of this is obvious when the fact is made known that the lungs present a mucous surface fourteen hundred square feet in extent, every inch of which is in the highest degree capable of absorbing gaseous substances brought in contact with it. This membrane is of the most marvelously delicate character, being of such exceeding thinness that it forms scarcely any obstacle to the passage of gases which enter the lungs by respiration. Just underneath

this delicate membrane passes all the blood in the body, or an amount equivalent to the whole volume of the blood, once every three minutes. The vapory poison inhaled by the tobacco-smoker is not simply taken into the mouth and then expelled, but it penetrates to the remotest air-cells, and spreads itself out over the whole of the immense extent of membrane stated. Thus it is plain that the blood of the smoker is literally bathed in the narcotic fumes drawn from his pipe or cigar.

So readily does the system receive the poison of tobacco in this way, that it has been repeatedly observed as a fact that persons who are engaged in the manufacture of cigars often suffer much from the characteristic effects of nicotine poisoning.

When tobacco is applied to the mucous membrane, as in chewing and snuff-taking, its poisonous elements are absorbed in essentially the same manner as when applied to the skin, but much more rapidly. In chewing, considerable quantities are also absorbed through the stomach, being swallowed with the saliva.

Poisonous Effects of Tobacco.—Very few users of the weed need to have a description of the effects of a moderate degree of poisoning with tobacco. The giddiness, nausea, and deathly sickness which follow the first attempt to use the poisonous drug are indubitable evidence of the poisonous character of tobacco, which evidence is confirmed by the difficulty—in many cases very great—experienced in becoming accustomed to its use. In severe cases of poisoning, violent vomiting and purging, vertigo, deathly pallor, dilatation of the pupil, a staggering gait, disturbed action of the heart, interference with respiration, and in extreme cases insensibility and syncope, are commonly observed. Only a very small quantity is necessary to produce these symptoms in a person not accustomed to the use of the drug; but in persons who have accustomed their systems to the poison, a much larger amount is required.

Dr. Richardson, who has recently given the effects of tobacco upon the human system a very thorough investigation, thus describes the condition of a person learning to smoke:—

"From analogy derived from the lower animals, which must be very perfect, the conditions of the vital organs are as follows:—

"The brain is pale and empty of blood, the stomach is reddened in round spots, so raised and pile-like, that they resemble patches of dark Utrecht velvet; the blood is preternaturally fluid; the lungs are pale as the lungs of a calf, when we see them suspended in the shambles;

while the heart, overburdened with blood, and having little power left for its forcing action, is scarcely contracting, but is feebly trembling, as if, like a conscious thing, it knew its own responsibility and its own weakness. It is not a beating, it is a fluttering heart; its mechanism is perfect, but each fibre of it to its minutest part is impregnated with a substance which holds it in bondage and will not let it go."

Why all Smokers do not Die of Tobacco-Poisoning.—It is often objected that while chemistry and scientific experiments seem to prove that tobacco is a powerful poison, the experience of thousands of persons disproves the theory of its poisonous character, since if it were so intense a poison as described, cases of death from tobacco-poisoning would be much more frequent.

To this objection we answer,—

1. One reason why so few persons are reputed to die of nicotine or tobacco poisoning, is the wonderful faculty the system possesses of accommodating itself to circumstances. Through this means the worst poisons may by degrees be tolerated, until enormous doses can be taken without immediately fatal effects. Corrosive sublimate, strychnia belladonna, and many other poisons, may be thus tolerated.

2. In our opinion, the majority of tobacco-users do die of tobacco-poisoning. Death as surely results, ultimately, from chronic as from acute poisoning, though the full effects are delayed, it may be, for years. A man who dies five or ten years sooner than he should, in consequence of tobacco-using, is killed by the poison just as truly as though he died instantly from an overdose.

Effects of Tobacco on the Blood.—The blood is the life-giving stream which carries to each of the tissues and organs of the body the material out of which it is to be built and repaired. In it are found the various elements which are received into the system through the stomach, the lungs, and the skin, the three great inlets to the body. If poisons are taken into the system, it is through the blood that they do their devastating work. Anything which affects the blood must affect every organ and tissue of the body. When taken in any form, tobacco very readily finds its way into the blood, and, according to Dr. B. W. Richardson, it produces in the vital fluid very serious changes. He describes these changes in the following graphic words:—

"On the blood the prolonged inhalation of tobacco produces changes which are very marked in character. The fluid is thinner

than is natural, and in extreme cases paler. In some instances the deficient color of the blood is communicated to the body altogether, rendering the external surface yellowish white and puffy. The blood, being thin, also exudes too freely, and a cut surface bleeds for a long time, and may continue to bleed inconveniently, even in opposition to remedies. But the most important influence is exerted over those little bodies which float in myriads in the blood and are known as the red corpuscles. These bodies have naturally a double concave surface, and at their edges a perfectly smooth outline. The absorption of fumes of tobacco necessarily leads to rapid changes in them; they lose their round shape, becoming oval and irregular; and instead of having a mutual attraction for each other and running together, a good sign of physical health, they lie loosely scattered before the eye, and indicate to the learned observer, as clearly as though they spoke to him and said the words, that the man from whom they were taken is physically depressed and deplorably deficient both in muscular and mental power." For a representation of the effects of tobacco on the blood, see PLATE XIV.

Tobacco not only deteriorates the blood, poisons it, and greatly impairs the blood corpuscles, but also disturbs the circulation through its influence upon the nervous system.

Having seen the effects of this poison upon the blood, it may be readily understood that it cannot but be a cause of disease.

Tobacco Predisposes to Disease.—By its deteriorating influence upon the system, tobacco lessens the vital resistance of the body to other causes of disease, and so produces a predisposition to nearly all classes of maladies. As bearing upon this point we may quote the following from eminent authorities:—

"Look at the pale face, imperfect development, and deficient muscular power of the inhabitants of unhealthy, malarious districts. They live on, but with only half the proper attributes of life. So it is with the habitual smoker."—*Mr. Solly, F. R. S.*

"I do not hesitate to say that if a community of both sexes, whose progenitors were finely formed and powerful, were to be trained to the early practice of smoking, and if marriage were confined to the smokers, an apparently new, and a physically inferior, race of men and women would be bred up."

"The effects of this agent, often severe even in those who have attained to manhood, are especially injurious to the young who are still

in the stage of adolescence. In these the habit of smoking causes impairment of growth, premature manhood, and physical prostration." *

A British officer in India stated that of eleven officers sent out on an expedition, only two escaped in good health, and they were non-smokers.

In speaking against tobacco, Dr. Edward Smith, an eminent English author and sanitarian, remarked, "The whole tendency of its action is toward disease, and it is impossible to say how much of good it has prevented."

Smokers' Sore Throat.—The redness and dryness of the mucous lining of the mouth and throat so common with smokers, is the result of the direct irritation of the hot fumes of the poisonous weed which are drawn in through the pipe or cigar. This cause of chronic disease of the throat is so very common that "smokers' sore throat" has come to be recognized as a distinct malady. Some smokers pretend to smoke for the cure of throat difficulties; but the excuse is a mere pretense in most cases. Tobacco never cures sore throat. It may temporarily relieve local irritation, but can do no more, and always increases the disease.

Tobacco and Consumption.—The relation of impure air to disease of the lungs is everywhere recognized. It has been very clearly demonstrated that breathing impure air is the great cause of consumption, on account of the effect of poisonous elements upon the blood and upon the lungs. Even the impurities gathered from the blood itself exist in such quantities in air which has been once breathed as to render it unsafe to breathe again. This being the case, it will be readily seen that filling the lungs with nicotinized smoke and the hot fumes of tobacco from a pipe or cigar for several hours a day, cannot but be a most certain cause of lung disease. Moreover, experience shows this to be the case. Dr. C. R. Drysdale, the chief physician to the Metropolitan Free Hospital of London, declared, in an article in *Public Health*, that "smoking in youth is no uncommon cause of pulmonary consumption."

Tobacco a Cause of Heart-Disease.—The effect of tobacco upon the heart is indicated by the pulse, which is a most accurate index to the condition of the heart. The pulse of a tobacco-user says, in terms as plain as any words could, that his heart is partly paralyzed,

* Diseases of Modern Life.

that its force and vigor are diminished, that it is, in fact, poisoned. Old smokers, and not a few of those who have indulged but a few years, often suffer with palpitation of the heart, intermittent pulse, *angina pectoris*, and other symptoms of derangement of this most important organ. There is, in fact, a diseased condition of the heart which is so characteristic of chronic tobacco-poisoning that it has been very appropriately termed "narcotism of the heart." Medical statistics show that about one in every four smokers has this condition. There is good evidence for believing that not only functional but organic disease of the heart may be occasioned by the use of tobacco.

Tobacco and Dyspepsia.—Notwithstanding the fact that tobacco is very frequently recommended as a sovereign remedy for dyspepsia, we have become convinced by careful observation in hundreds of cases, that it is never a cure, and is in hundreds of instances a cause of dyspepsia. Tobacco is a narcotic. The effect of narcotics generally is to lessen the secretion of gastric juice, and to decrease the activity of the stomach. Tobacco does this in a very marked degree. A man who is hungry may appease his desire for food by using tobacco if he is accustomed to it, or by the employment of some other narcotic. The desire is appeased, although the want still exists. It is through this same paralyzing influence that tobacco impairs digestion. Snuff-taking occasions dyspepsia by producing irritation of the nasal mucous membrane, which affects the stomach through sympathy.

A man cannot use tobacco to any considerable extent without becoming a dyspeptic. It is the impairment of digestion which renders tobacco so efficient an agent, in most cases, in reducing flesh. We have treated scores of tobacco dyspeptics, and have no hesitation in affirming that the disease is incurable without the discontinuance of the habit. Even when the habit is abandoned, a cure is often difficult, requiring months of careful attention to diet and treatment.

Tobacco a Cause of Cancer.—There is no chance to doubt that tobacco-using is often a cause of this terrible disease. All eminent surgeons testify that they frequently meet cases of cancer of the lip and tongue which have been occasioned by smoking. A number of such cases have come under our observation, and we do not doubt that a large share of cancers of the lip and tongue originate in this way. This view is further strengthened by the fact that in the great cancer hospital of London, where more than ten thousand cases of this terrible disease have been treated, the number of men suffering from the disease

upon the lip and tongue was three times as great as the number of women so affected, although the female cancer patients outnumbered the men five to one.

Tobacco Paralysis.—In the last thirty years there has been a great increase in the frequency of the occurrence of a peculiar form of paralysis which seems to affect especially the nerves that supply the muscles, causing gradual wasting and loss of muscular power, which is fairly attributable to the increasing use of tobacco, as it most often occurs in tobacco-users.

A form of progressive paralysis of the optic nerve, causing "tobacco amaurosis," or blindness, is well recognized by oculists. These cases generally recover when the tobacco is discontinued, and will not get well so long as it is used.

Tobacco-blindness is very common in Ireland, where very strong tobacco is used. It is caused both by smoking and chewing.

Color-blindness, an affection which is increasing to an alarming extent, especially in Belgium and Germany, where smoking is more extensively practiced even than in this country, has been found to be largely attributable to the use of tobacco. This fact was first made known by an eminent Belgian physician who made extensive investigations upon the subject at the request of the Belgian government.

Nervousness from Tobacco.—Tobacco-users suffer much from nervousness, which is manifested in a great variety of ways. One person is easily startled; another is unnaturally irritable, is cross and irascible; another cannot sleep at night; still another suffers with trembling of the hands, which greatly discommodes him in writing. In scores of cases we have seen these symptoms all disappear when the use of tobacco was discontinued. Temporarily, tobacco seems to give tone and strength and steadiness to the nerves, but the seeming strength is deceptive. It is purely artificial, and the ultimate effect is to increase the very difficulty which it seems to cure.

We have often known wives and young children to suffer very severely from various nervous disorders which were wholly due to the effect upon their delicate organizations of the poisonous fumes of tobacco which they received through the poison-laden exhalations of their smoking husbands and fathers.

Dr. L. G. Alexander, of Kentucky, in a late article in the Philadelphia *Medical and Surgical Reporter*, in which he gave an account of

several cases of tobacco-blindness, remarks as follows respecting tobacco and nervous diseases :—

"The use of tobacco is so general that its bad effects can hardly be estimated. So much has been written, pro and con, that to discuss the subject is superfluous. The rapid increase of nervous people, nerve pain, neuralgia, and obscure nervous disease, is seen in practice every day by the physician, and is so frequent as to attract the attention of the laity; and it is my belief that the common use of tobacco, as well as of alcohol and opium, is the most prominent cause of so many nervous troubles."

Plenty of evidence exists to show that tobacco-using is a very common cause of impotence, together with the many other forms of nervous disease arising from its poisonous effects. Numerous other maladies might be mentioned as being caused, either directly or indirectly, but it will suffice to say that there is scarcely a functional disorder or an organic disease to which the human system is subject, which may not be either produced or aggravated by this subtle poison.

Hereditary Effects of Tobacco-Using.—There is no vice or habit to which men are addicted the results of which are more certainly transmitted to posterity than are those of tobacco-using. A vigorous man may use tobacco all his life and be able to convince himself all the time that he is receiving no injury; but the children of that man, who ought to inherit from him a vigorous constitution and high health, are instead robbed of their rightful patrimony, and enter upon life with a weakly vital organism, with a system predisposed to disease and destined to premature decay. The sons of an inveterate tobacco-user are never as robust as their father; and the grandchildren, in case the children are tobacco-users, are certain to be nervous, weakly, sickly creatures. This fact we have verified in so large a number of cases that we make the statement fully prepared to maintain it by indisputable facts.

The physician last quoted, in the same article referred to, remarked on this question as follows :—

"From observation I have found that the children of parents addicted to the use of tobacco are more likely to have nervous diseases than others born of parents who do not use it; and if both parents use it, we are almost certain to find the offspring of a nervous temperament, and especially liable to nerve derangement. It is from this class that drunkards are mostly recruited. Growing up with a weak nerve development, any physical or mental exertion brings on the disease now so common, neurasthenia."

Moral Effects of Tobacco-Using.—There can be no question but that tobacco has a seriously deteriorating effect upon the character, blunting moral sensibility, deadening conscience, and destroying that delicacy of thought and feeling which is characteristic of the true Christian gentleman. This effect is far more clearly seen, as would be expected, in youth who begin the use of tobacco while the character is receiving its mold, than in those who have adopted the habit later in life, though too often plainly visible in the latter class of cases. There can be no question but that the use of tobacco is a stepping-stone to vices of the worst character. It is a vice which seldom goes alone. It is far too often accompanied with profanity and laxity of morals, and leads directly to the use of alcoholic drinks. It is indeed the most powerful ally of intemperance; and it is a good omen for the temperance cause that its leaders are beginning to see the importance of recognizing this fact and promulgating it as a fundamental principle in all temperance work. By this means only can any real headway be made against the great evils of intemperance.

Apologies for Tobacco-Using Considered.—We have already devoted as much space as is proper to the subject of tobacco-using, and can only notice briefly one or two of the more specious arguments used in favor of the drug.

Probably the most powerful argument offered in behalf of the tobacco habit is the assertion by certain physicians that tobacco, along with alcohol and kindred drugs, is a sort of "negative food," diminishing the necessity for food by lessening the wastes of the body. As already shown in reference to alcohol, this argument is ingenious; but instead of proving the desirability of the drug, it proves the opposite. The argument is just as good for tobacco as for alcohol. The fact that the natural secretions are diminished by the use of tobacco, cannot be any more of a recommendation to the drug than to nitric acid and mercury, which will do the same, or indolence and malaria, which will have the same effect. What people of the present day need, with their gross habits of eating and drinking and deficient physical exercise, is not less excretion, but more. Torpidity of the liver, inactivity of the skin, deficient activity of the kidneys, and constipation of the bowels, are among the greatest impediments to real mental and moral growth and culture in the present age; and these conditions are certain results of the use of tobacco.

Another argument often strongly urged is, that, admitting the un-

natural character of the habit of tobacco-using, it is nevertheless made necessary by the artificial conditions of civilized life, by the excessive mental strain and nervous excitability resulting. It is claimed to be essential as a means of soothing the tired brain and securing sleep. A full and complete answer to this argument is the fact that tobacco is itself a cause of the very conditions which it is supposed to remedy, as elsewhere shown; and while it seems to act with temporary benefit in some cases, it ultimately aggravates the very troubles which it is used to relieve.

Much more might be said upon this subject; but we must leave it here, hoping that the candid reader will find no difficulty in agreeing with us in the conclusion that tobacco is an unmitigated evil, and one which should be thoroughly and faithfully exposed on every proper occasion, until the public are well informed of its dangers. We conclude with the indorsement of the sentiment expressed by Charles Lamb, in his "Farewell to Tobacco," in the lines,—

> "Stinking'st of the stinking kind,
> Filth of the mouth and fog of the mind,
> Afric, that brags her foison,
> Breeds no such prodigious poison.
> Henbane, nightshade, both together,
> Hemlock, aconite——," etc.

A TEA TOPER.

SMOKER'S CANCER.

PLATE A.

TEA AND COFFEE.

Fig. 176. Stem of Tea Plant, showing Flowers.

Under this head we shall consider tea, coffee, and cocoa, or chocolate.

Tea consists of the dried leaves of a plant which is native to China, but is also grown in India and various other parts of the world, to which it has been introduced. The active principle of tea is *theine*, a narcotic alkaloid, of which it contains three to six per cent. The other most abundant constituent is *tannin*, of which it contains about twenty-six per cent. The remainder is made up of gum, vegetable fibre, sugar, fat, starch, and an aromatic oil to which its varying flavor is chiefly due. See Fig. 176.

Coffee is the roasted berry of a plant native to Arabia and Abyssinia, known as *Coffæa Arabica*, which is closely allied to the plant from which Peruvian bark is obtained, the source of quinine. Its active principle is *caffeine*, which is identical with theine, of which it contains about one-third as much as tea. It also contains tannin, though in less quantity than tea, together with gum, sugar, caseine, fat, and the other ingredients also found in tea.

Chocolate is obtained from the seeds of the cocoa-palm, native of Mexico, the pods of a ground-nut, a shrub native of Zanzibar, and other sources. The substances from which it is produced are ground

to a powder, then mixed into a paste with sugar, and dried in cakes. Cocoa, or cocoa nibs, consists of the nuts coarsely broken. The active principle of cocoa, or chocolate, is *theobromine*, the proportion of which, according to the analyses of Dr. Stenhouse, is five per cent.

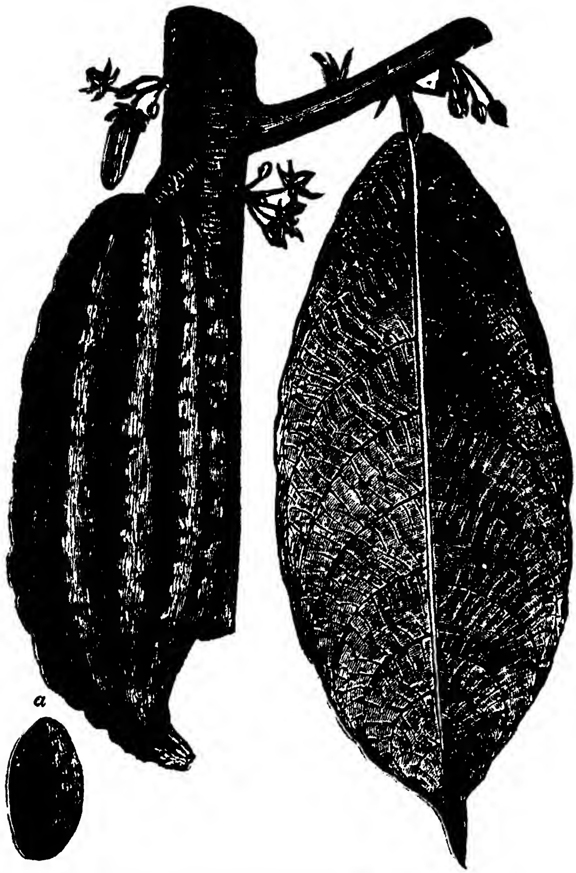


Fig. 177. Leaf and Fruit of Cocoa. *a.* Cocoa Bean.

Theobromine is closely related, chemically, to theine, with which it is practically identical. The remaining constituents are chiefly fat, starch, sugar, coloring matter, and woody fibre. See Fig. 177.

Maté, or Paraguay tea, and *chaat*, or Abyssinian tea, are the leaves of trees or plants which possess active principles essentially the same in nature and properties as theine. See Fig. 178.

History of the Use of Tea and Coffee.—Among civilized nations, the use of tea and coffee, as well as of the other beverages named, is confined to modern times. It is said that coffee has been in use in Arabia, its native home, a thousand years, and that tea has been used in China and Japan for about the same length of time. It was not

Fig. 178. Maté, or Paraguay Tea.

until the middle of the sixteenth century, however, that coffee was first introduced into Europe by the establishment of a coffee-house in Constantinople, and another century passed before it was introduced into England. Its introduction into Constantinople was vigorously opposed by the priests, who asserted that its use was contrary to the teachings of Mahomet; but the desire for stimulation soon triumphed over religious scruples, and the Turks are now known as among the most inveterate coffee-users in the world. Its use was also opposed at its first introduction into more civilized lands, though far less vigorously than was the use of tobacco. From their full introduction to

civilized nations, only about two centuries ago, these beverages have gradually come in more and more extensive use, especially during the last half-century. The annual consumption of tea and coffee, and their congeners, at the present day, is estimated by competent authorities to be as follows: Tea, 3,000,000,000 lbs.; coffee, 1,000,000,000 lbs.; cocoa and chocolate, 100,000,000 lbs.

Maté is used by at least 40,000,000 people, being the common beverage of the natives of South America, where the tree from which it is obtained grows abundantly without cultivation. It is probable that fully one-half the human race, if not a larger proportion, make use of one or more of these beverages. In England, tea is the favorite drink, 100,000,000 pounds being annually imported into that country. It is also the favorite beverage in Russia and Holland. In Turkey, Sweden, France, and Germany, coffee is the favorite. In the latter country the amount of coffee used is fourteen pounds for each person.

Effects of Theine upon Man and Lower Animals.—Numerous experiments upon the direct effects of theine,—as also its allied substances, caffeine and theobromine,—conducted by Dr. E. Smith, Dr. Richardson, and others, show that in small or ordinary doses it causes an increased action of the heart, an increased elimination of carbonic acid through the lungs, loss of heat, and increased activity of the kidneys. In larger doses, it produces nausea, vertigo, and finally insensibility and death. Dr. Edward Smith, after drinking an infusion made from two ounces of coffee, which probably contained about seven grains of caffeine, fell to the floor unconscious.

A prominent official in the British army, now doing service in Africa, recently lost his favorite horse in a manner which is both singular and instructive. A cook left a few pounds of tea in the sack which had contained it, which was filled with corn by a Kafir groom who knew nothing of the presence of the tea. Upon serving out the corn to a troop of horses, of course the last one received the larger share of the tea, which was eaten greedily with the corn. The result is thus described:—

"The animal plunged and kicked, and ran backward, at intervals galloping madly around, finally falling into a donga, where it lay dashing its head on the rocks, and was dispatched by an assegai thrust through the heart. The post-mortem appearances indicated extreme cerebral congestion."

Coffee also lessens the action of the skin.

Evil Effects of Using Tea and Coffee.—The evil effects of the use of these popular beverages have made too evident their injurious character to allow of room to doubt their deleterious influence, notwithstanding the apologies offered for their use by those who are accustomed to employ them. These evil effects we will attempt to point out as briefly as possible.

1. They Waste Vital Force.—By the experiments of Dr. Smith, M. Gazeau, and many others, it is shown that the consumption of the body is greater under the influence of tea or coffee than at other times, since the amount of carbonic acid eliminated is greater than natural, the amount of carbonic acid sent out from the lungs being the best known measure of the rate of waste of the body. The amount of extra waste thus occasioned is shown by Dr. Smith's experiments to be from one-fourth to one-tenth that of the whole waste of the body, whence Dr. Smith very consistently remarks that it is especially adapted to "those who usually eat too much." This is a tacit confession that at the least the use of tea is an expensive and wasteful habit.

2. Tea and Coffee Injure Digestion.—When taken upon an empty stomach, these beverages produce, as is well known, serious irritation of the digestive organs. When taken with the food, impairment of digestion is produced in several ways: (*a.*) By taking into the stomach too large a quantity of liquid; (*b.*) By relaxing the stomach by the use of liquids of too high a temperature, by which, also, the activity of the gastric juice is impaired; (*c.*) By precipitating the pepsin with the tannin which they contain. Chocolate induces indigestion.

That the use of tea and coffee is a common cause of dyspepsia is an observation made by all experienced physicians. At the last meeting of the British Medical Association, an eminent physician from Australia testified that dyspepsia from the use of tea and coffee is very common in that country. Sir William Robert has shown that both tea and coffee, even in small proportions, prevent the action of saliva upon starch, thus producing one of the most common forms of indigestion. The writer has demonstrated the correctness of these observations, both by experiment and clinically, having recorded a great number of cases in which grave disorders of digestion were evidently due to the use of tea and coffee.

3. The Use of Tea and Coffee Affects Injuriously the Nervous System.—This statement would seem to be satisfactorily established by

its well-known temporary effects. It is well known that whatever excites vital action above the normal standard, without supplying an extra amount of force to support the extra expenditure, invariably produces, as a secondary result, depression of vital action below the normal standard, or what is known as a reaction. That this is one of the secondary effects of the use of strong tea, is well known. Tea may be used so weak that the reaction is not noticed, but no doubt it is still felt in some degree by the organic system, if not by the nerves of animal life. This continued alternation of excitement and reaction must certainly result in injury to the nervous system, increasing the liability to nervous diseases of a functional character, such as neuralgia (neurasthenia), hysteria, etc.

Moral Effects.—The long-continued use of tea has a distinct effect upon the character. This has been too often noticed and remarked to be questioned. An eminent neurologist, writing in a recent number of the *Journal of Mental and Nervous Disease*, calls attention to this fact in the following remarks:—

"Irritability of temper, like dyspepsia, belongs in the category of symptoms produced by long-continued tea-drinking.

"There are '*tea sots*' in every great charitable institution,—particularly those for the maintenance of the aged. Their symptoms are generally mental irritability, muscular tremors, and sleeplessness."

The eminent Dr. Bock, of Leipsic, writes as follows respecting the influence of tea and coffee on character :—

"The nervousness and peevishness of our times are chiefly attributable to tea and coffee ; the digestive organs of confirmed coffee-drinkers are in a state of chronic derangement, which reacts on the brain, producing fretful and lachrymose moods. Fine ladies addicted to strong coffee have a characteristic temper, which I might describe as a mania for acting the persecuted saint. Chocolate is neutral in its psychic effects, and is really the most harmless of our fashionable drinks. The snappish, petulant humor of the Chinese can certainly be ascribed to their immoderate fondness for tea."

Tea-Drinkers' Disorder.—That there is a distinct class of symptoms characteristic of the effects of alcohol, of tobacco, of absinthe, and of opium, has long been generally recognized ; it is only recently, however, that the morbid effects of tea have been sufficiently well studied by eminent physicians to secure the recognition of the fact that tea and coffee, as well as the other poisons mentioned, produce such a distinct class

of symptoms. It is now conceded, however, that the use of tea may, and often does, produce a morbid condition which has been appropriately termed, tea-drinkers' disorder.

Less than a year ago, Dr. J. W. Morton, of New York City, a physician of eminence, was led by observing the symptoms of a case which occurred in his practice, to believe that tea is far from being the harmless agent by many supposed. He at once began an investigation of the subject, and directed his attention to a large class of persons to be found in most large cities, known as "tea-tasters." The facts which his investigation elicited are so valuable in this connection that we shall quote quite liberally from his paper on the subject which appeared in the *Journal of Mental and Nervous Disease*, for October, 1879. We quote as follows:—

"The pernicious effects of tea-tasting upon many of its followers, are well recognized by all their number. It seems to be accepted among them, without discussion, that many break down and are obliged to give up the business, or else pursue it with much caution and at constant inconvenience to their health. And those of the public who are at all familiar with the facts, entertain the same view. Indeed, I may say that if I were now to express an opinion, based upon my present, it is true not yet sufficiently extensive, information upon the subject, I should feel inclined to say that no one engages for several years in the profession of 'tea-tasting' without suffering both immediate and permanent harm to health."

"This feeling is well illustrated in the remark of a prominent wealthy tea merchant, who said, 'I would rather give a hundred thousand dollars than have my son become a "tea-taster."'

"At first glance, to witness the operation of tasting, it would hardly seem possible that the very small amount of tea used at any one time could result in harm. This amount is only equal in weight to a five-cent piece, about fifteen grains. About two ounces of well-boiled water are turned on to this, and the infusion is allowed to 'draw,' perhaps, fifteen minutes. Of this infusion the taster takes but a few spoonfuls into his mouth, and often spits it out again; he also at intervals inhales the steam. But the harm comes, of course, from the constant repetition of these acts.

"The cases which I propose to relate exhibit the extreme physiological action of an infusion of tea. They are cases of acknowledged excess; and in this lies their interest, for by familiarity with the symptoms

of excess, we shall be able to thread our way back to those of moderation, and to point out, it may be, that what many perhaps consider moderation is, in reality, abuse, and that certain symptoms put down as 'nervousness,' 'nervous irritability,' and 'nervous exhaustion,' as well as the more clearly defined ailments of dyspepsia, hypochondria and hyperemia, may sometimes be attributed to the misuse of a common domestic beverage. Indeed, I am forced to think that many people, unconsciously to themselves and to their physicians, suffer from a train of symptoms due to tea (or its congener, coffee). We often find people taking tea to relieve the very set of symptoms which its abuse, as will be shown later, produces; and it is often the fact that patients date their recovery from a dyspepsia or nerve exhaustion from the time when they gave up their tea."

The following is an account of one of the cases observed:—

"The immediate effects upon him are as follows: In about ten minutes the face becomes flushed, the whole body feels warm or heated, and a sort of intellectual intoxication comes on, much the same in character, it would seem, as that which occurs in the rarefied air of a mountain. He feels elated, exhilarated, troubles and cares vanish, everything seems bright and cheerful, his body feels light and elastic, his mind clear, his ideas abundant, vivid, and flowing fluently into words. He has found from experience that the workings of his intellect are really more clear and vigorous than at any other time. This is not a delusion on his part, for at this time he can 'talk a man over,' and make a more advantageous bargain than at others.

"At the end of about an hour's tasting a slight reaction begins to set in; some headache comes on; the face feels wrinkled and shriveled, particularly about the eyes, which also get dark under the lids.

"At the end of two hours this reaction has become fully established, the flushed, warm feeling has passed off, the hands and feet are cold, a nervous tremor comes on, accompanied with great mental depression. And he is now so excitable that every noise startles him; he is in a state of complete unrest and mental exhaustion; he has no courage to do anything; he can neither walk nor sit down, owing to his mental condition, and he settles into a complete gloom. His body in the meanwhile does not feel weary. Copious and frequent urination is always present, as also certain dyspeptic symptoms, such as eructations of wind, sour taste, and others.

"The above-described immediate effects follow a single afternoon's

tea-tasting. They may be summed up briefly as excited circulation, intellectual intoxication, with actual increased vigor of mind power, increased urination; then a period of collapse indicated by cold extremities, tremulousness, mental irritability and anxiety. It will be several days before this condition of affairs is amended. And at this time the temptation to take alcoholic stimulants is very strong.

"The chronic effects are few and decided. Headache is frequent, principally frontal and vertical; a ringing and buzzing in the ears is very constant; black spots often flit before the eyes, and he sees flashes of light. Vertigo also is very persistently present; he cannot look up at a clock on a steeple without staggering. Insomnia exists to a considerable extent; he seldom has a good night's sleep, and he dreams much, but his dreams are of a pleasant character; he sometimes sees visions when not sleeping. Dyspepsia is more troublesome than any of the foregoing three symptoms. This the patient assigns strictly to tea-tasting, since it is made worse by tea, and improves when he abstains from it, though now becoming confirmed. His appetite is captious, he feels heavy at the epigastrium, he has eructations and a sour taste, and finds that certain kinds of food distress him. He has a frequent gurgling, and is in the habit of 'working' his whole chest and abdomen to make the gas pass on.

"His mental condition is peculiar. He lives in a state of dread that some accident may happen to him; in the omnibus, fears a collision; crossing the street, fears that he will be crushed by passing teams; walking on the sidewalks, fears that a sign may fall, or watches the eaves of the houses, thinking that a brick may fall down and kill him; under the apprehension that every dog he meets is going to bite the calves of his legs, he carries an umbrella in all weathers as a defense against such an attack. He often dreads entering his office for fear of being told that some business friend has failed; and in short, lives in a state of constant foreboding of some impending evil. At times his left leg drags and feels numb, and he is conscious of an unsteady gait. He has also often a twitching of the muscles of the face and eyelids.

"The chronic effects as above described, as distinguished from the immediate effects, are, in brief, vertigo, headache, insomnia, dyspepsia, mental depression, almost amounting to delusions, and also some slight subjective and objective signs of a central disturbance of both sensibility and motility.

"I omit negative evidence indicating that otherwise than as related, he is in sound health.

"A certain group of his symptoms point to hyperemia of the brain, another to disorder of the digestive function, and still another to morbid alterations of intellection, sensibility, and motility; all taken together presenting, as I venture to suggest, a clinical picture of tea-poisoning."

Similar effects were observed in all the cases investigated. In order to still more conclusively establish the relation between the effects described and the use of tea, Dr. Morton conducted a series of experiments in the use of tea himself, and obtained similar effects to those described by the persons interviewed. Since the publication and circulation of his observations, an attempt has been made to discredit his statements, which was undoubtedly prompted by those engaged in the business, and who are fearful of suffering pecuniarily through the diminution of the use of tea. The observations of Dr. Morton are, however, so well confirmed by other observers that the attempt has proved a futile one.

To the eminent medical testimony against tea already given, we may add the following from Dr. B. W. Richardson:—

"Some functional nervous derangements are excited by fluids commonly consumed with, or as, foods. Tea taken in excess is one of these disturbing agents. Tea exerts an astringent action, and by the presence in it of an organic substance, theine, it exercises a special influence over the nervous system, which, to say the least, is temporarily injurious. I believe the effects from tea are more severely felt by the young, and that as middle age approaches, they are less severe.

"The symptoms which indicate the injurious action of this article of food are sufficiently characteristic. They are, intensely severe headaches, constipation of the bowels with what is usually considered to be deficiency of bilious secretion, flatulency, an unsteadiness and feebleness of muscular power, and not infrequently, a lowness of spirits amounting to hypochondriacal despondency. In children under the influence of tea this lowness of spirits is often very severe, so severe that the occurrence of the simplest natural phenomena, as the approach of darkness, the cast of a large shadow, or the spreading over the sky of dark clouds, are sufficient to create dismay and fear.

"In poverty-stricken districts, amongst the women who take tea at every meal, this extremely nervous, semi-hysterical condition from the action of tea is all but universal. In London and other fashionable centers in which the custom of tea-drinking in the afternoon has

lately been revived under the old name of 'the druni,' these same nervous symptoms have been developed in the richer classes of society, who, unfortunately, too often seek to counteract the mischief by resorting to alcoholic stimulants. Thus one evil breeds another that is worse.

"The flatulency induced by tea taken late in the evening has the effect of interfering with the processes of sleep; it prevents or disturbs sleep by dreams and muscular startings, and is a common cause of that peculiarly painful symptom known as nightmare.

"The extremely injurious effects of tea are best seen in some of those who are charged with the commercial duty of what is called 'tea-tasting.' A professed 'tea-taster' who was so seriously affected by the process that he thought it proper to consult me on the symptoms induced, defined the symptoms very clearly as follows: 'Deficiency of saliva; destruction of taste for food; biliousness; nausea; constipation; an extreme and undefinable nervousness; and nightmare whenever sleep is obtained.'

"The symptoms from which habitual tea-drinkers suffer are identical in character, but minor in degree."

"Coffee, like tea, induces dyspepsia, and perhaps, with even more activity than tea, it keeps the brain awake when that wearied organ ought, according to nature, to be asleep."

ARGUMENTS IN FAVOR OF TEA AND COFFEE CONSIDERED.

Notwithstanding the numerous facts against these beverages, so popular is their use that there are many who profess to find apologies for employing them; a few of these we will now consider.

1. Tea and Coffee Sustain the Strength.—The same argument urged for tobacco and alcohol is also presented in favor of tea and coffee; but its value is no greater in the case of the latter than in that of the former. That it does not sustain either muscular or nervous strength is shown by scientific experiments which cannot be refuted by any number of unreliable accounts of the great amount of work which can be performed by persons who take little else than tea. Dr. Smith remarks that the use of tea appears to increase muscular activity, as under its influence there is greater ease in making exertion; but he immediately adds that if exercise be taken, "a greater sense of exhaustion follows" than when tea has not been taken; which shows, most conclusively,

that the feeling of strength is not real, but deceptive, and that a person is really less fitted for exertion of any kind while under the influence of tea than at other times. Dr. Smith further remarks, in summing up the effects of tea, that exercise while under its influence is followed by "reaction, with a sense of exhaustion," and this is said to be felt even after having had a night's rest. No better evidence of the damaging influence of these drugs could be required.

If it be argued that the amount taken by ordinary consumers of tea is insufficient to produce any ill effect, we have but to call attention to the fact that the wealthy, besides using the strongest tea, take it in doses even larger than those employed by Dr. Smith in his experiments. It is not at all uncommon for persons with whom expense is not an item of moment, to take at each meal a quantity of the infusion of tea of such strength as to contain not less than five to fourteen grains of theine, a smaller amount than which has been known to cause unconsciousness and temporary paralysis. A single teaspoonful of dry tea may contain seven or eight grains of theine, and this is not an uncommon allowance for each person at a meal.

2. Tea and Coffee Soothe the Nerves.—How do they soothe the nerves? Do they furnish the requisite material for repairing the worn and exhausted organs? No. They only temporarily *excite* them, so that their real condition is for a time obscured; but when their evanescent effect has vanished, the nerves are in greater need than before of being soothed, and each application of the remedy makes the evil worse. This is the reason why we seldom find a confirmed tea-drinker who is not troubled with nervousness. It is also equally true that the great majority of sufferers from this disease are tea or coffee drinkers. In hundreds of instances these nervous tea-drinkers have fully and speedily recovered their health by abandoning their use of the article. This is a sure and simple remedy.

3. Tea and Coffee Assist Digestion.—"My stomach is so weak," says a tea-drinking dyspeptic, "that a cup of good strong tea is necessary to enable me to digest my meal." Yes; this is doubtless the case; and if you continue the practice you will find, after a time, that *two* or *three* cups will be necessary to enable you to dispose of your dinner satisfactorily. Then if you persevere in the habit, in spite of the admonitions of your best medical adviser, nature, you will shortly find it quite impossible to swallow a sufficient quantity of the beverage to make your stomach perform its work. Then you will begin to realize the fact that

goading an organ into action is quite a different thing from encouraging and promoting its healthy activity by supplying it with healthful, nourishing food.

Do not be deceived by momentary sensations. Consider the ultimate effects, and you cannot fail to be convinced that instead of promoting digestion, tea and coffee are most effective disturbers of that function. How they interfere with digestion has already been explained.

4. Tea and Coffee Relieve Headache.—How invariably the unsuspecting lady resorts to a cup of tea to relieve the distress occasioned by that common malady, sick-headache! Yes; and how invariably that same sick-headache returns! Who ever heard of a person who was permanently cured of sick-headache by tea-drinking? Such a thing would be impossible. Tea and coffee are among the prime causes of sick-headache, although they afford temporary relief, just as tobacco and alcohol are prolific causes of tremors, but yet appear to steady the trembling nerves for a short time.

5. Tea and Coffee Supply the Place of Food.—Many people who are largely addicted to the use of the articles will prefer a cup of strong tea or coffee to a hearty meal of nourishing food. Indeed, it is a general custom with the English peasant to reduce his bread fare one-half that he may be able to procure a cup of tea to accompany the remainder. Dr. Arlidge, of England, has recently called attention to the fact that the women of the working-classes in that country have carried this practice of substituting tea for food to such an extent that they are beginning to manifest the most unmistakable evidence of narcotic poisoning.

Tea silences the demand of the system for food, but it does not in any respect replace it, as may be seen by the weakened energies and the attenuated forms of those who use it largely. As elsewhere remarked, Dr. Smith has shown that tea-drinkers need more food than others instead of less.

6. Tea and Coffee Increase Mental Vigor.—Those who make this claim, mistake mental *activity* for mental strength. A greater error could not be made; and yet this fallacious notion is very popular. See the poor victim of delirium tremens trembling with fright at the fantastic and threatening shapes which his excited fancy portrays. His imagination was never so active in health. Now it makes him see forked tongues darting at him from every corner, and converts every

shadow into a monster. Who will venture the assertion that his mind is stronger now than when in health? Listen to the ravings of the patient during the delirium of fever; the mind is certainly active, but it cannot be said to be strong; for strength is only consonant with health.

When the brain is stimulated to unnatural activity by tea, coffee, tobacco, alcohol, or any other stimulant, it makes violent attempts to accomplish whatever task may be imposed upon it. But the calm, deliberate action of the mind is impossible. The highest efforts of genius can never be exhibited under such circumstances. Is it argued that some of our greatest mental workers, as Voltaire and Johnson, were users of tea or coffee, we would, in answer, call attention to the nervousness, irritability, and irascibility which notably characterized the last years of the life of each of these men. Here we see the legitimate results of the use of tea and coffee, and it is very probable that had these men been more nearly correct in their habits of life they would have achieved even greater success than they did.

It was long ago decided by eminent physicians that excitement is not strength. It has quite as long been recognized that every unnatural increase of physical or mental action *must* be followed by a corresponding descent below the average standard of activity.

Then every minister who drinks a cup of strong tea to increase the animation of his discourse, borrows a certain amount of vivacity and energy from some future effort. So every student who goads up his weary brain with a cup of tea to enable him to steal time from sleep, is making a double draft upon his capital of mental force and ability. So, too, the young lady who stimulates with tea to enable her to entertain her visitors, is laying the foundation for future intellectual poverty and mental inefficiency.

7. Tea and Coffee Correct the Injurious Effects of Poor Water.—When no other reason can be offered for the continuance of a bad habit, this one is frequently presented. Its absurdity makes it almost insusceptible of candid consideration. How strange that the addition of a poison to water already bad enough should improve it! The assertion is wholly without foundation in fact, and never would have been advanced as an argument by tea-drinkers, except for the lack of any better. Two poisons are always worse than one, unless they neutralize each other; but no such chemical properties are claimed for tea and coffee.

8. Tea and Coffee are Necessary Condiments.—One writer upon dietetics tells us that the utility of tea and coffee does not depend upon their peculiar principle, theine, but that it is wholly the product of a certain aromatic oil which they contain, and which he denominates "osmazome." This gentleman argues that food cannot be digested unless it is relished; and that since tea and coffee, in company with other condiments, make the food more palatable to the taste, they must be essential to nutrition.

While it is certainly true that the value of any article as a food depends very largely on its gustatory properties, it cannot be for a moment supposed that the mere question of taste is *sufficient* to settle the nutrient quality of an aliment. In other words, an article may be exceedingly pleasing to the taste, and yet be equally injurious to the health and quite unfit for food. If this were not the case, how would the epicure and the glutton rejoice; for then they might gratify their appetites without restraint.

Again, an article may possess little or no gustatory property, and yet be a most valuable and indispensable aliment. Such is the case with pure water. We do not hesitate, then, to declare this argument for the use of tea and coffee to be without weight. It is, indeed, a fact now coming to be recognized more and more fully, that all condiments are not only useless, but injurious, tea and coffee with the rest.

9. Tea and Coffee are Substitutes for Food.—Tea and coffee, as well as alcohol and tobacco, have been called by some physiologists "accessory foods," because, as was alleged, they prevent the rapid disorganization of tissues, which always accompanies organic activity. It might be easily shown that this would be most undesirable, if it were really true; for vital action is not only accompanied *by* organic change, but is inseparably connected *with* it. Some even say that it is dependent upon it. But we need not enlarge upon this, for it is claimed by our best authorities that careful experiments demonstrate the fact that change is *accelerated* instead of impeded by the use of tea and coffee. While we have little confidence in the reliability of any of these experiments, there being many chances for error, they are very interesting on some accounts.

A popular writer says, "Science almost always finds some foundation in fact for popular prejudices." In this case we have a very excellent illustration of this fact. Quite a number of illustrious individuals have been for some time recommending the use of tea and coffee, be-

cause, as they claimed, they prevented the ordinary rapidity of tissue change, and so lengthened life and economized food. But now we find Dr. Smith, the author of the latest and most popular and reliable work on foods, telling the people that they should use tea and coffee because they *increase* the rapidity of tissue change, and so increase the available force of the individual. Thus it appears that those who use tea and coffee need to eat more food instead of less, as heretofore claimed.

The only conclusion to be drawn from these facts is that even scientific men are sometimes so blinded by the fogs of appetite that they lose sight of true principles and allow themselves to be guided by their prejudices. Reason and common sense must decide from the facts in the case, independent of all such contradictory, and hence unreliable, testimony.

10. Tea "Cheers and not Inebriates."—Philosophers have speculated, theologians have moralized, and poets have waxed eloquent, about "the cup that cheers and not inebriates." Doubtless we shall startle such when we say that, although this is very pretty poetry, it is false in fact. Tea and coffee, as well as tobacco, are as truly capable of producing a condition of intoxication as is alcohol. Intoxication is a condition in which the sensibilities are paralyzed and the mind delirious. In more than one instance has this identical condition been induced by the use of tea and coffee.

In Australia, drunkenness from the use of tea is very common. In South America, a person who is greatly addicted to the use of coca is called a *coquero*, which means the same as our word drunkard. The maté, or Paraguay tea, of South America, the active principle of which is precisely the same as that of tea and coffee, produces not only intoxication but delirium tremens. Abyssinian tea, another form of the same principle, used in Shoa and among the poorer classes in some parts of China, is said by Johnson to be very intoxicating.

We have already referred to the fact that Dr. Edward Smith, of England, when conducting some experiments on the "physiological action" of coffee, fell to the floor insensible, in company with his assistant, as the effect of drinking strong coffee.

Dr. Cole, of England, describes the cases of several individuals who were frequently found lying insensible as the result of tea-drinking. One case which he mentions was an author who was thus found two or three times a week.

Indeed, the man who is so far bereft of his reason that he is wholly

insensible is not the only person who is drunk. Every man who takes into his system any kind of stimulant, be it tea, coffee, tobacco, opium, arsenic, or alcohol, is drunk just in proportion to the dose, and all his actions will be more or less unnatural.

The word intoxicate is derived from the Latin word *toxicum*, poison, *intoxicatum* meaning to drug or poison. Intoxication, then, is a condition of poisoning; and it is wholly immaterial whether opium, alcohol, tobacco, tea, or coffee is the agent employed.

Holding that tea and coffee are harmless beverages, many temperance workers have urged their introduction as substitutes for alcoholic drinks; and for this purpose temperance (?) coffee-houses have been established in many of our large cities.

We believe, however, that in the effort to reform drunkards and prevent intemperance no greater mistake can be made than to attempt to substitute one stimulant or narcotic for another. It is possible that temporary benefit may be derived from the establishment of coffee-houses in districts where a sudden and extensive temperance reform has been effected, but the ultimate effects of substituting tea or coffee for alcoholic drinks, as a cure for intemperance, will prove it to be a fatal error. The great sin of intemperance is not in the use of alcohol, *per se*, but in the gratification of the desire for artificial stimulation. We fully believe that the use of tea and coffee, especially when it is begun early in life or indulged to any degree of excess, is a by no means insignificant cause of intemperance, the use of one stimulant leading to another, until the grossest forms of intemperance are reached. The facts to which attention has already been called in our consideration of the subject will justify this conclusion. We fully agree with the sentiment expressed by an eminent New York physician, that "The only consistent teetotalism is that which abstains from all forms of stimulants and narcotics." We thoroughly believe that more harm is done at the present time by tobacco, tea, and coffee, than by all forms of alcoholic drinks combined; and we deem it of the greatest importance that the efforts of temperance workers should be turned in this direction. We are glad to see some omens of progress toward true teetotalism, one of the most promising of which is the recent formation of the American Health and Temperance Association, which, although only inaugurated on New Year's of 1879, has already effected more than twenty auxiliary State societies, and more than a hundred local organizations, and secured a membership of more than

ten thousand. The teetotal pledge of this Association requires abstinence from alcohol, tobacco, tea, coffee, opium, and all other narcotics and stimulants.*

The work of this organization is being pushed with vigor through its agents in all parts of this country, and in England, Sweden, Norway, and Switzerland. It is to be hoped that other temperance organizations will take hold of this work also.

THE USE OF OPIUM.

Within the last few years the consumption of this narcotic drug has been increasing in this country to an alarming extent. Thirty years ago the amount of opium imported was about 130,000 pounds annually. To-day, according to the report of the chief of the Bureau of Statistics, it is not less than 400,000 pounds. Of this amount not more than one-fifth is used for medicinal purposes, leaving the enormous amount of 320,000 pounds to be disposed of by habitual users of the drug. The exact number of opium consumers cannot be determined with any degree of accuracy, as the devotees of the drug usually avoid disclosing the habit as much and as long as possible. Careful inquiries of druggists, and others likely to be the best posted, have elicited facts upon which it is perfectly safe to base the estimate that there are not less than 100,000, and very probably as many as 200,000, habitual opium-takers in the United States.

Enormous Doses Taken.—The amount of opium consumed by an old opium-eater is sometimes enormous. We have had cases in which twenty grains of morphia, equivalent to 320 grains of opium, were taken at a single dose, with no more effect than would follow the administration of one-fourth of a grain to a person unaccustomed to its use. One of the most recent cases which have come under our care at the Medical and Surgical Sanitarium at Battle Creek, Michigan, was that of a woman who had been addicted to the drug for nine or ten years, and had increased the quantity from less than a grain a day to ninety-six grains in the twenty-four hours, equivalent to more than three ounces of opium, together with a pint and a half of brandy.

Narcotic Nostrums.—In addition to this enormous consumption of opium by those addicted to its use, immense quantities are used in various quack nostrums and in so-called "antidotes." Probably the most

* Those who desire further information respecting this organization, can obtain it by addressing the Association at Battle Creek, Mich.

widely used nostrum containing opium is Mrs. Winslow's Soothing Syrup, of which no less than 750,000 bottles, containing about one grain of morphia each, have been sold in a single year. This quantity is sufficient to destroy the lives of many thousands of infants, who are very susceptible to the influence of the drug, as no doubt it has done.

Causes of the Habit.—Probably the greatest of all causes of this enormous increase in the habit within the last few years is its reckless and uncalled-for use in medicine. It is the custom of many physicians to prescribe opium in some form for almost every ache or pain which they encounter in practice. If they find a patient suffering pain, whether from an acute attack of colic, a chronic neuralgia, a face-ache from a decayed tooth, a back-ache from some uterine disease, or a fractured limb, an opiate is at once prescribed, and often before ascertaining what may be the patient's condition. We have treated quite a number of persons suffering from the opium habit, and have never met a case in which we were not informed by the patient that the habit began with a physician's prescription. This is the general testimony of all who have examined this question. We have had patients who had been taught by their physician to take morphia by means of the hypodermic method (injection beneath the skin), whose bodies were so completely covered with scars that it was scarcely possible to find a spot within reach of the patient's own hands, and not uncovered by the clothing, which had not been punctured by the needle of the hypodermic syringe one or more times. In one case, a patient was actually driven to seek relief from the terrible habit by sheer inability to find new places for puncturing the skin. The most common method of taking the drug, however, is by the mouth. The physician gives a prescription which the patient has filled and refilled, until the habit is firmly fixed. We have many times heard patients condemn in no stinted terms the physicians who first introduced them to the fascinating drug, apparently forgetting that they may have been themselves in a large measure to blame, since it is a most common thing for patients to demand of physicians medicines which will produce immediate palliative effects, not once thinking that nature must effect the cure, and that time will be required to remove the cause of the disturbance so as to obtain relief in a natural way.

Effects of the Opium Habit.—The continued use of opium is followed by effects far more serious than those from the use of tea, coffee, tobacco, or alcohol. It is an evil that every physician ought to do his utmost to expose, warn against, and prevent. Probably

physicians can do more than any or all other persons combined to cure the habit, by exercising care to avoid in every possible way and under all possible circumstances the use of opium as a medicine. There are numerous other measures of relieving pain, and all available means should be tried before resorting to this drug, so likely to make the sufferer whom it temporarily relieves a greater sufferer in the end.

The government of Pekin has taken measures to check the enormous consumption of opium in that country by interdicting its use after the beginning of the present year, under a most severe penalty. If there is need of prohibitory legislation respecting any form of intemperance, this certainly is the one of all others requiring it, and the one for which there seems to be the best chance for success.

Tyranny of the Habit.—Of the fascinating powers of this drug and the extreme difficulty of overcoming the habit, so much has been written that we need say nothing. The confessions of the opium-eater, De Quincey, portray in far more graphic lines than could we, the terrible bondage of an opium slave. We should say a word, however, with reference to its cure. The numerous antidotes for the opium habit advertised in the newspapers are the basest frauds imaginable. The examination of a large number of them by Dr. Prescott, of the Medical Department of the University of Michigan, a few years ago, showed them to be, without exception, compounds of opium. In this case the remedy is not worse than the disease, but identical with it. The habit is not incurable, however, as many suppose. With proper treatment all can be cured, and in a comparatively brief space of time. In the case mentioned, in which ninety-six grains of opium were taken daily, the patient, although suffering with an acutely painful disease, was completely cured in less than six weeks, though she had been addicted to the use of the drug for many years, and in addition was addicted to the use of liberal quantities of alcohol, a combination much more difficult of cure than either habit alone. Other patients have been cured in three or four weeks, or in shorter periods. The method of treatment is described elsewhere.

Absinthe, Chloral, Ether, etc.—The use of absinthe, chloral, sulphuric ether, and of other narcotics and stimulants, is followed by results the most serious in character; but we have not the space to dwell upon these, as the evils consequent upon their use are of small importance when compared with the great evils resulting from the use of the drugs to which we have already called attention.

HYGIENE OF THE AIR.

In this section we shall consider the composition of the air, the impurities with which it is likely to be contaminated, the sources of contamination, disinfection, and the best modes of ventilation and heating.

The Atmosphere.—The air is a very complex mixture of gases and minutely divided solids in the form of dust and minute germs. The chief and essential constituents of the air are nitrogen and oxygen, in the proportion of 79 parts of the former to 21 of the latter, ignoring the numerous other constituents, which are too small in quantity to be regarded in this connection, though of immense importance in their relations to health. Oxygen in the form of *ozone* is usually found in pure air in small proportions. In this state, oxygen is exceedingly active, and is a powerful disinfectant. Oxygen is converted into ozone by the action of the volatile oils of flowers and the vapor of resinous substances. It is abundant in pine forests on account of the slow evaporation of pitch. Its chief source, however, seems to be electricity, hence it is very abundant after a thunder storm. It is in part due to this fact that the air seems so much purer and fresher after such a storm.

Carbonic acid is naturally found present in the air in the proportion of 4 parts in 10,000, or .04 per cent. Another essential ingredient is watery vapor, which is found in varying proportion according to the location, season of the year, temperature, and other varying conditions.

It has been found by numerous experiments that the proportions in which oxygen and nitrogen are found in the air cannot be greatly changed without injury to health, although the nitrogen seems to be useful chiefly to dilute the oxygen, and may be replaced, temporarily at least, by such a neutral gas as hydrogen. If the oxygen is diminished, even so little as two or three parts in a hundred, respiration becomes very difficult, and a lighted candle burns very dimly. A slightly lower percentage of oxygen is insufficient to support combustion.

As air expands with the elevation of temperature, the equivalent amount of oxygen decreases. Thus, air at 90° F. contains an amount of oxygen equivalent to only about nineteen-twentieths of the usual

amount at 60° F.; while air at 32° F., on account of condensation of volume, contains an amount of oxygen equivalent to one-twentieth more than the usual amount at 60° F. It is this which causes the lassitude consequent upon a great rise in temperature, as also the habitual and characteristic inertness of the natives of hot climates. The fact also accounts for the tonic and invigorating effects of cold air. These observations agree entirely with the results of experiments which show that the inhalation of an increased proportion of oxygen increases vital action, while the opposite effect is produced by a diminished quantity.

An increase of altitude has an effect upon the atmosphere similar to that of increased temperature. The air rapidly diminishes in density, or grows thinner, as the altitude increases, so that at a height of a little less than three and one-half miles its density is only one-half of that at the surface of the earth. At an elevation of less than 9,000 feet the density of the air is decreased to such an extent that a given volume contains oxygen equivalent to only about three-fourths of that contained in an equal volume at the surface. An effect exactly the same in kind but less in degree is produced by the changes in barometric pressure which are constantly taking place. When the barometer falls, the air is thinner, and less oxygen is respired. When it rises, the opposite effect is produced. These facts account for the feeling of oppression and want of air experienced by those who ascend to great heights on mountains or by means of balloons. This we experienced in a very unpleasant degree in the Rocky Mountains at an altitude of less than 14,000 feet, upon attempting to exercise even in a very gentle manner. Persons who have ascended to greater heights have found the difficulty to increase proportionately with the altitude. The same facts also account for the enervation and oppression often felt just prior to and during a storm, when the barometer usually falls, owing to the decrease in the density of the atmosphere. It will be readily understood that a sudden rise in temperature accompanied by a fall of the barometer would produce a double degree of interference with respiration, by decreasing the amount of oxygen inhaled at each breath. The amount of oxygen taken in at a single respiration with the thermometer at 80° and the barometer an inch and a half lower than usual, would be equivalent to only nine-tenths of the amount of oxygen taken in with the barometer at its usual height and the temperature at 60°. This very readily accounts for the extreme degree of enervation, and often prostration, felt, especially by nervous people and invalids, just prior to a storm in very hot weather.

Persons living in an elevated atmosphere in some degree compensate for the diminished amount of oxygen in the air by increasing the amount taken in at each respiration. This is said to result in increasing the lung capacity of people residing in such localities. It is also supposed that the necessity for increased action of the lungs and the breathing of a larger amount of air is the means by which persons suffering with some forms of pulmonary disease are apparently benefited by residence in elevated districts.

As before remarked, the amount of watery vapor in the air varies greatly with the locality, season, and other conditions. The air of countries located near the sea, or other large bodies of water, contains a large proportion of watery vapor when the wind is in the direction of the water. When the wind is blowing in the opposite direction, the air is apt to be quite dry. Just before a storm the air is usually nearly saturated with vapor. In the warm season of the year the degree of saturation of out-door air and that within doors is about the same. In the winter season, however, owing to the higher temperature of in-door air, it is very much drier unless watery vapor is added by artificial means. This is owing to the fact that air acquires by increase of temperature a greater capacity for absorbing moisture. This point need not be dwelt upon further, as it has been fully explained in connection with the hygiene of respiration.

Impurities of the Air.—The principal impurities of the air to which we shall call particular attention are as follows:—

First, various gases, comprising carbon-dioxide or carbonic acid, carbonic oxide, ammonia, sulphureted hydrogen, and various noxious gases arising from the decomposition of organic matter, from rendering establishments, chemical works, and other sources.

Second, germs and other minute living bodies consisting of spores, animalcules, etc.

Third, dust, consisting of minute particles of earthy matter, fragments of hair, fibres from clothing, minute portions of small insects, particles of decomposing matter, and a great variety of substances too numerous to mention.

We will now notice more in detail some of the more important of these impurities and their sources.

Carbonic Acid.—Of the various poisons which contaminate the air, carbonic acid, or, more properly, carbon-dioxide, is the most abundant. While not the most dangerous, it may be considered as the

chief impurity of the air. It is produced by the burning of wood, coal, and all ordinary combustibles, by the respiratory processes of animals and plants, and by the decay or decomposition of organic substances. It is also produced by various chemical processes, as the burning of lime in lime-kilns. Carbonic acid is an invisible, odorless gas, a fact which adds to its dangerous character, since it makes it impossible to detect its presence by the senses. It is heavier than air, and hence has a tendency to accumulate in low places, as in unused wells, deep valleys, caves, and similar places. Some of the properties of

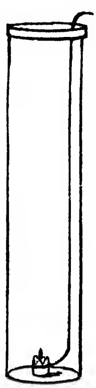


Fig. 179.
Candle Extinguished by Carbonic Acid Gas.

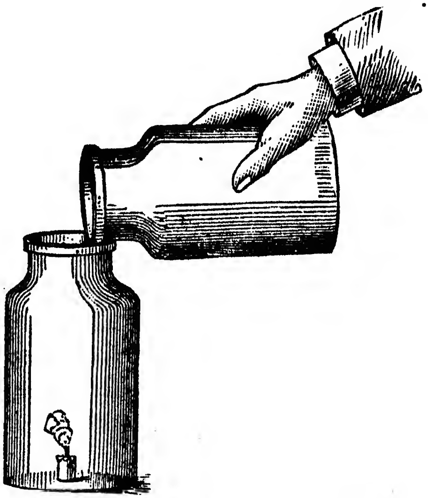


Fig. 180. Pouring Carbonic Acid Gas.

this gas may be easily observed by making the following experiment:—

Place in a deep glass jar—a two-quart fruit can will answer the purpose admirably—two heaping teaspoonfuls of bi-carbonate of soda or saleratus. Add a teaspoonful of water and allow the soda to dissolve. Now add a teaspoonful of strong vinegar. Immediately upon the addition of the vinegar a vigorous chemical action will occur, accompanied by great effervescence, the result of the liberation of carbonic acid gas. In a few minutes the action will cease. Now, if a bit of candle be lighted and let down into the jar, by means of a wire, it will be extinguished almost as soon as it enters the mouth of the jar. (See Fig. 179.) This shows that the carbonic acid gas will not support combustion. Indeed, it is one of the best means of extinguishing fires, being employed for this purpose in the Babcock and other forms of ex-

tinguishers. That the gas is heavier than air is shown by the fact that it can be poured from one vessel to another; and also by the fact that when generated in the manner described it will remain for some time in the jar in which it is produced. While the jar is still full of gas, or before very much has been allowed to escape, raise it carefully to the mouth of another empty jar and perform the act of pouring exactly as though it were filled with water, as shown in Fig. 180. The fact that the carbonic acid has been poured into the jar may be shown by letting down into it a lighted candle as represented in the figure referred to.

The presence of carbonic acid may also be demonstrated in another manner. It is well known that chalk is a chemical compound of lime with carbonic acid. By pouring into the jar half a teaspoonful of clear lime and slaking thoroughly after placing a cover over the jar, the carbonic acid will combine with the lime, producing chalk, which will give to the water a milky or cloudy appearance. Lime-water is easily made by slaking freshly burned lime in water and allowing it to settle until clear. The clear solution may be turned off into another bottle, boiled, corked, and preserved for use at any time required.

The most important sources of carbonic acid in the air of dwelling-houses or other confined spaces occupied by human beings, where alone there is much danger from this gas, are respiration and the combustion of gas, oil, candles, and other illuminating substances. The presence of carbonic acid in the breath may be easily shown by a slight modification of the experiment described in the preceding paragraph. Take a clean glass jar, and cover the mouth closely with writing-paper. Make two holes in the paper cover large enough to admit the end of the little finger. In one of these insert a glass tube or a large straw of sufficient length to reach to the bottom of the jar. Place the mouth at the other end and breathe into the jar for one or two minutes, taking care not to draw into the lungs any air from the jar. If a short piece of lighted candle be now let down into the jar as before immediately after removing the cover, it will be extinguished at once. The presence of carbonic acid in the jar may also be detected as in the previous experiment by putting into the jar a small quantity of lime-water, and shaking it for a few seconds. The production of chalk is indicated by the cloudy appearance, proving the presence of carbonic acid as before stated.

The amount of carbonic acid produced by each adult person is

about one cubic inch at each breath, which would amount to twenty cubic inches, or about two-thirds of a pound, in a minute, or two-thirds of a cubic foot in an hour. The ordinary oil-lamp produces about the same quantity of carbonic acid as a person. A good candle produces from five to ten times as much. Immense quantities of carbonic acid are produced in stoves, fire-places, and furnaces, but these we do not need to take into account, as it is conducted away with the smoke through the chimney.

Carbonic acid is not so active a poison as many other gases with which the air is sometimes contaminated, but numerous experiments performed upon birds, mice, and other small animals, as well as upon human beings, have shown beyond the possibility of a doubt that it is directly poisonous to all forms of animal life even in small quantities. In the quantity in which it naturally exists in the atmosphere,—3 to 4 parts in 10,000,—it is not injurious to animal life and is of great service as gaseous food to plants and all forms of vegetable life. If, however, its proportion be increased to 6 or 7 parts in 10,000, it becomes decidedly prejudicial to health. This is true, however, only when it is produced by the respiration of animals or human beings, and is generally considered to be due more directly to the organic poison with which carbonic acid from these sources is always associated than from the carbonic acid itself. It has been shown to be true, however, that if pure carbonic acid from any source be added to the air in such quantity as to reduce the proportion of oxygen even as little as one-tenth per cent, or one part in a thousand, serious results will follow.

Test for Carbonic Acid.—The most reliable authorities all agree that the proportion of carbonic acid should never be allowed to become greater than 6 parts in 10,000; hence, it is important to be able to detect the presence of this gas, especially since, as before remarked, it cannot be readily detected by any of the senses. Fortunately, this may be accomplished by very simple means, the use of which requires only ordinary care. The materials required to perform the test are, a supply of perfectly clear, saturated lime-water, and four bottles or jars of different sizes, the sizes required being the following: one jar or bottle capable of holding exactly 16 ounces, or one pint; a second holding 10½ ounces; a third holding 8 ounces, or one-half pint; and a fourth capable of holding 6½ ounces. The jars should have necks large enough to admit of perfect cleaning of the whole inside, and the great-

est pains should be taken to remove every particle of dirt or dust from the inside as well as the outside, with water. To apply the test, fill the jar with the air to be tested. This may be done either by drawing the air out of the bottle through a straw or tube, or by filling it with pure water and letting the water escape. Great care should be taken in sucking the air out of the bottle that the breath be not allowed to enter. To determine the amount of carbonic acid present, use the smallest jar first. After filling it in the manner described, pour in a large table-spoonful of clear lime-water. Close the mouth with a clean stopper and shake vigorously for a minute or two. If the lime-water becomes cloudy, carbonic acid is present in the air in the proportion of 10 parts to 10,000. If it does not become cloudy, repeat the experiment with the next sized jar or the half-pint jar. If the lime-water becomes cloudy in this, the proportion of carbonic acid is 8 parts in 10,000. This proportion may often be found in the rooms of dwelling-houses, and sometimes in crowded streets and narrow alleys. If the lime-water does not become cloudy in the jar of this size, the next size should be used in the same manner. The cloudiness appearing in this jar indicates the presence of 6 parts in 10,000. This is the largest proportion which may exist without actual danger to life. If no cloudiness appears without the employment of the largest jar, the proportion is only 4 parts of carbonic acid to 10,000 of pure air.

Carbonic oxide, or more properly, carbon mon-oxide, is a gas closely allied to carbonic acid in its chemical composition, though very much more dangerous. This gas is produced only by incomplete oxidation. It is always found in the burning of coal in grates and stoves; but as it is a combustible gas, it is usually consumed, and so gives rise to no evil consequences. It is the burning of this gas which produces the blue flame characteristic of coal-fires. When the draft of a stove or range is seriously obstructed, this gas often finds its way into the air breathed by human beings. By its penetrating character it readily passes out of stoves seemingly air-tight through the minute cracks between the different pieces of iron of which the stove is composed. It has been shown by experiment, also, that it passes with great facility through cast-iron when heated red-hot. This does not take place, however, so long as there is a sufficient draft, as that portion of the gas which escapes combustion is carried away with the smoke. Whenever the draft is obstructed, however, there is danger that this exceedingly poisonous gas may find its way into the air and be taken

into the lungs. Carbonic oxide is also produced by gas-jets and lamps when turned down so low that incomplete combustion of the escaping gases takes place. The amount of gas which may be produced in this way is so great that serious consequences may result where ventilation is defective, as in sleeping in a close bed-room where the gas-jet or lamp is turned down very low, since it requires but an exceedingly small proportion of this gas to produce serious effects. Ordinary burning gas usually contains quite a large proportion of carbonic oxide and it is undoubtedly the presence of this gas which causes the inhalation of coal-gas to produce such fatal results. Death is produced by carbonic oxide by its paralyzing effect upon the blood-corpuscles. It renders them incapable of absorbing oxygen, so that a person poisoned by it really dies of suffocation.

To avoid danger of poisoning from carbonic oxide, the following suggestions should always be observed: First, avoid the use of close dampers in stoves or stove-pipes, and always secure a good draft from coal-grates; second, never allow the fire-box of a heating furnace to become red-hot; third, never allow gas-jets or lamps to burn when turned down so low that combustion is incomplete. The indication of the incomplete combustion of gas or oil is the presence of odors by which they are characterized and which may always be observed when a room is entered where a gas-jet or lamp turned low has been burning for some time. Of the other poisonous gases which find their way into our rooms, the most injurious is *sulphureted hydrogen*, a gas which is always produced in the decomposition of animal matter. It has a very strong odor,—that of rotten eggs, and is very poisonous in character. It is present in sewer-gas, in the gas escaping from vaults, cesspools, barn-yards, and all emanations from decomposing animal excreta as well as from decaying animal bodies. The odor of carrion is strongly laden with sulphureted hydrogen, and this is one of the most common sources of the gas, since small animals not infrequently secrete themselves in the open spaces underneath dwellings, when about to die. Chickens, cats, dogs, and other animals often die and undergo decomposition in such places. It is on this account very unwise to use poison of any kind for the purpose of getting rid of rats and mice or other small animals.

Ammonia is often present in the air arising from animal decomposition, its chief source being cesspools, vaults, and particularly stables and barn-yards.

Other noxious gases arising from chemical works, dye-houses, etc., are so seldom met with, or are so obviously injurious in character, that we do not need to mention them in detail.

Disease Germs.—Modern science has demonstrated through the aid of that wonderful little instrument, the microscope, that the most powerful of all the enemies to human life are those which are most insignificant in size. Through the researches of Pasteur, Tyndall, and other eminent workers in this field, it has been shown beyond a chance for question that the air which we breathe always contains in greater or lesser numbers minute living bodies known as germs. In Fig. 181 may be seen some of these minute organisms greatly magnified. As seen in the cut, they are simply roundish bodies, mixed with other bodies of various shapes, which are particles of dust as seen when greatly magnified. Wherever decay of either animal or vegetable matter has taken place, germs are developed and given off in

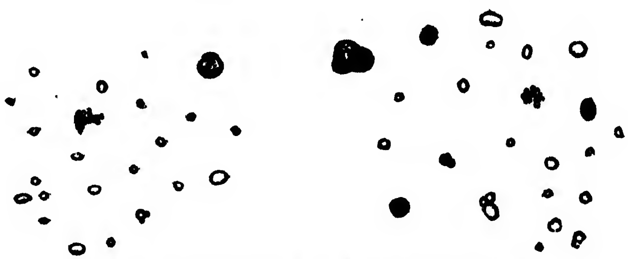


Fig. 181: Atmospheric Dust Greatly Magnified.

great numbers. Mold from moldy bread, when placed under the microscope, may be seen to throw off into the air an immense number of minute particles termed spores, which are capable not only of giving rise to growths of mold, but are thought by scientists to be active in producing some forms of disease. Some so-called germs are animalcules, while others are germs of vegetable life. It is the presence of certain varieties of these little germs which occasions the fermentation of beer, the "rising" of bread, the "working" of cider, and the "spoiling" of canned fruit and other preserved products, the "souring" of milk, and all kinds of decay and decomposition. The conditions required for the growth and development of these minute organisms are warmth and moisture. In winter they are paralyzed by the cold, but as soon as the vernal sun appears, they spring quickly into life and activity. They are not affected by a very low temperature, and have even been known to withstand for hours a temperature con-

siderably above that of boiling water. In the vicinity of cesspools, vaults, barn-yards, and other places where decomposition is going on, the air is heavily laden with these disease-producing agencies.

Their office in the economy of nature seems to be to destroy bodies possessing higher forms of life, or, at any rate, to assist higher forms of organization to return to the inorganic or unorganized state. When the body is kept in a healthy condition, all its tissues possessing a high degree of vitality, it is unaffected by these agents of decay and death; but so soon as the standard of vitality is lowered in any degree, or when the system is attacked by germs in great numbers, possessing unusually active properties, we become a prey to their ravages and subject to a variety of maladies of the most fatal character. There seems to be at present little room for doubt that typhus and diphtheria, cerebro-spinal meningitis, malarial fevers, all of the contagious diseases, and perhaps a large number of others, the cause of which has not been so carefully studied, are produced by these agents. The presence of germs in the air cannot be very readily detected by any test which relates directly to them, but it may be safely considered that whenever and wherever foul odors are present, germs are also to be found, since these two sources of disease are almost invariably associated together, having the same origin.

It should be remembered, however, that germs may be present when foul odors are not, since they may be formed and given off before a sufficient degree of decomposition has taken place to give rise to offensive gases. This fact should lead to the prompt removal of anything which is known to be a source of germs, since these minute and invisible bodies are far more serious in their effects upon the human system than any foul gas with which the air is ordinarily contaminated. The mold upon the wall should be regarded with the gravest suspicion, and measures should be promptly taken for a removal of its cause. A musty odor is evidence of the presence in the air of spores thrown off by mold which may become the cause of serious disease.

Nine tenths of all diseases, if not all, are caused by specific low organisms. Among those which have been already distinctly isolated, are the microbes of consumption, typhoid fever, yellow fever, dysentery, cholera, lock-jaw, pneumonia, and a long list of diseases whose exact number is not known. Even such simple diseases as boils, run-rounds,

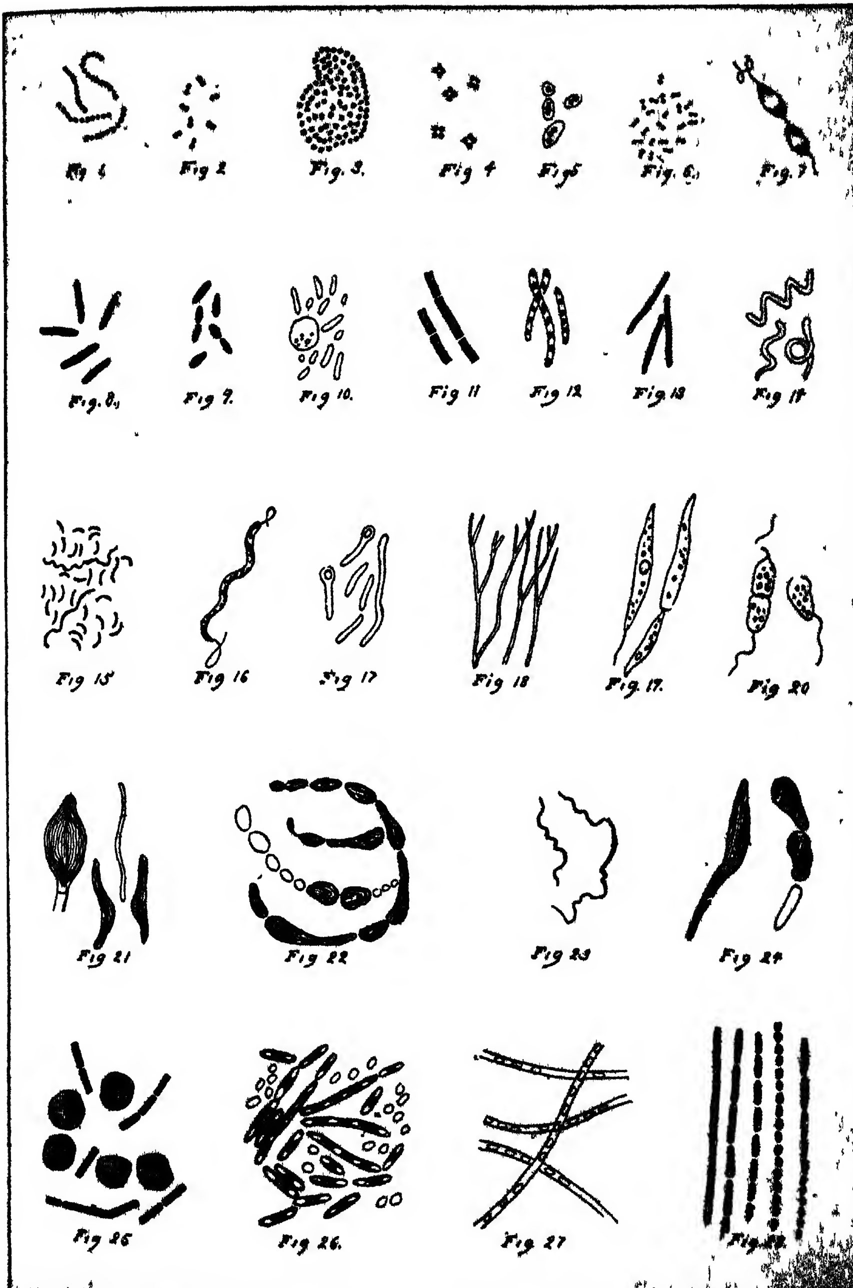


Plate XV. — *MICRO-ORGANISMS.*

(For explanation, see back of plate.)

EXPLANATION OF PLATE XV.

This plate is a representation of the microscopic appearance of the principal classes of micro-organisms, commonly called germs, at present known. There are an almost infinite number of subdivisions and variations, but the forms shown will give a very fair idea of the appearance of the principal forms of so-called germs.

Fig. 1. Micrococci arranged in chains (*streptococci*).
Fig. 2. Micrococci in pairs (*diplococci*).
Fig. 3. Micrococci in a mass or swarm (*zoogloea*).
Fig. 4. Micrococci arranged in groups of four, found in the sputa of consumptive patients.
Fig. 5. Micrococcus of pneumonia.
Fig. 6. *Bacteria termo*, found in decomposing matter.
Fig. 7. *Bacteria termo* magnified 4000 diameters.
Fig. 8. *Bacillus subtilis* (the hay bacillus found on manure, or in a decoction of hay).
Fig. 9. *Bacteria lineola*, germs from stagnant water; sometimes seen in slimy masses on rotten potatoes; also found in well water.
Fig. 10. Bacillus of typhoid fever.
Fig. 11. Malaria bacillus, found in the blood in cases of malarial fever.
Fig. 12. Bacillus of tuberculosis.
Fig. 13. Bacillus of leprosy.
Fig. 14. *Spirillum undula*, found actively moving in decomposing infusions.
Fig. 15. Cholera germs.
Fig. 16. *Spirilla volutans*, a germ with flagella, found in marsh water.
Fig. 17. *Vibrio regula*, germs found in decomposing vegetable matter.
Fig. 18. *Cladothrix dichotoma*, the most common germ found in water containing decomposing animal or vegetable matter.
Fig. 19. *Rhabdomonas rosea*, germs which form the red-colored scum on ponds.
Fig. 20. A germ similar to the preceding, of a pale red color, found in stagnant water.
Fig. 21. Forms of germs found in stagnant water and in drain pipes. The latter are sometimes obstructed by the white masses formed by them.
Fig. 22. *Bacterium aceti*, the germ which produces vinegar.
Fig. 23. Cholera germs.
Fig. 24. A germ which causes fermentation.
Fig. 25. Germs of *anthrax* in blood from spleen of a mouse.
Fig. 26. Germs of *anthrax* grown on a potato.
Fig. 27. *Anthrax* germs at a different stage of growth.
Fig. 28. Different stages of growth of a germ discovered in foul water.

warts, etc., have been traced to germ causes, and the decay of the teeth is also chargeable to the action of germs. There is a great difference between these different germs, just as there is between large plants, A fence which will be perfectly safe against cattle may prove of no account against dogs; and where pine trees will grow, we may not be able to raise potatoes. Similar differences exist also between these microbes.

All of these germs of diseases require moisture for their germination and growth. They are not killed by dryness; they only do not develop. A well-authenticated case is on record where the plague, which, during the recent outbreak in Hong Kong, China, was shown to be a germ disease, broke out in a town in Germany 200 years after the last plague had been there,—and while no cases of plague were within 1000 miles,—after the tearing down of an old house, in the masonry of which a mummy was found that had been cemented in. From records it was evidently the corpse of a person who had died of the plague 200 years before. This shows the wonderful tenacity of microbes. They will survive freezing, having been known to remain alive in a solid cake of ice. Medical science has been revolutionized by their discovery.

There is some difference of opinion respecting the exact nature of the germs which give rise to different diseases, and as to the exact mode of their development and transmission; but it is certainly settled that decomposing matter furnishes a fertile soil for the development of the germ-causes of the diseases mentioned and many others. Uncleanliness is now much better understood as being the factor in spreading diseases. Virchow examined the nails of school children, and underneath them he found, with particles of dirt, bacilli and eggs of all the intestinal parasitical worms, which, of course, would be eaten by the children with their daily bread.

But what do you know about these germs you talk so much about? says one. Is not this all an hypothesis? We answer, The connection of germs with the phenomena of decay and disease, is something more than an hypothesis. A germ is not an hypothetical thing, like the ether of physical science. Germs have been seen and studied by the aid of powerful microscopes, with the greatest care. Their species, modes of development, favorite habitats, and the conditions essential to their existence, have been worked out with almost as much completeness as the same points with reference to the most common of our higher plants and animals.

Organic Poison. — Very little, indeed, is known of the real nature of this poison, since it has, in considerable degree, eluded the efforts of the chemist to submit it to analysis; but it is of organic origin, and hence is known by the term *Organic Poison.* This poisonous element is introduced into the air chiefly by means of respiration, together with exhalations from the skin. It is one of the most noxious poisons ever present in air. It will produce death much sooner than most other impurities found in the air. It is this which gives to an unventilated room the close, fusty odor with which every one is familiar. One who has been long in the room will not observe it; but it is very distinct to a person coming in directly from the pure air outside.

Dust.—It is next to impossible to obtain air wholly free from dust. Its constant motion lifts and holds suspended little particles of various substances which are more or less injurious to health, unless the quantity is very small indeed. Some trades, as stone-cutting, coal-heaving, rag-picking, cotton and wool spinning and weaving, and other vocations which involve the production of considerable quantities of dust, expose the workmen to an atmosphere loaded with fine particles which are drawn into the lungs with every breath, and, finding lodgment there, may induce irritation and still more serious disease of those organs. By a wonderful provision of nature, as elsewhere explained, the finer particles of dust, if in small quantity, may be wholly removed so that they will not pass down into the more delicate air-cells of the lungs; but if the quantity of dust is great, this provision fails to afford protection.

The inhalation of dust is one of the causes of consumption. Post-mortem examination of the lungs of persons who had died from this cause showed the lungs to have acquired the color of the particles inhaled; and, in some cases, they contained so large a quantity of sand that they felt gritty to the touch.

Great care should always be taken to avoid dust as much as possible. In sweeping carpets and dirty floors, a person is exposed to injury unless some precaution, such as sprinkling the floor or moistening the broom, is taken to prevent filling the air with dirt. There are very few people who would not turn with disgust from food which was filled with particles of coal or sand, covered with dust, and gritty to the teeth. Yet the same persons will take their gaseous food in precisely the same condition without remonstrance.

Fig. 1. Consumption Germs.

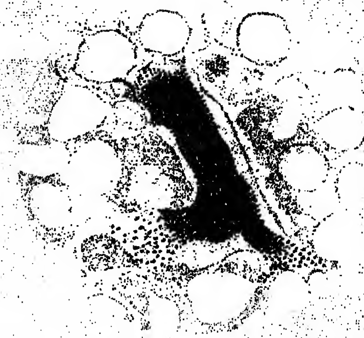


Fig. 2. Pus Germs in Liver.

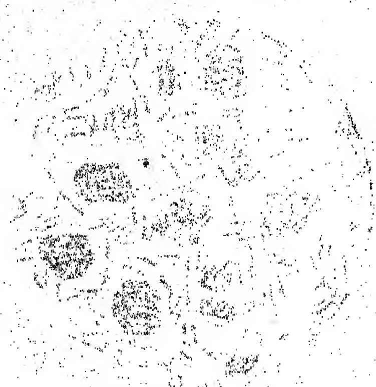


Fig. 3. Germs in Leper's Skin.

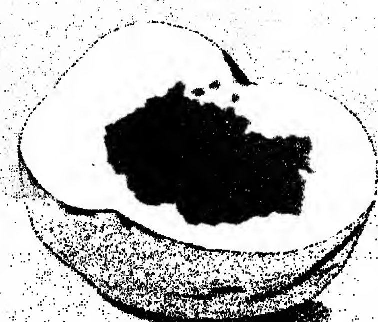


Fig. 4. Bacterium Prodigiosum.
(Blood Rain)

Fig. 5. Pus Germs.

Fig. 6. Germs from Blue Milk.

PLATE F. GERMS.

If necessarily exposed to dust for a time, danger from its inhalation may be avoided by applying over the mouth and nostrils a cotton-wool respirator, by means of which the air will be strained. A pocket-handkerchief will answer a very good purpose in the absence of a respirator.

Various Sources of Dangerous Gases and Disease Germs.—Under this head we shall notice various sources of air contamination which we have not yet referred to, or have barely mentioned, many of which are often the unsuspected causes of wide-spread and fatal disease.

Cellars.—Many families who wonder "why some of the children are sick all the time" can find the cause underneath the floor. Nearly all houses have cellars. Here are stored all sorts of things for winter use—dead things and live things, articles to eat and fuel to burn, old boxes and barrels, heaps of coal, bins of vegetables, etc., etc. The coal and wood are continually sending up foul gases. Many of the vegetables undergo decay, and add greatly to the formation of disease-producing elements. Besides the cellar, there is usually an open space under the other portions of the house, between the foundation walls. In the country this space is often large enough to admit dogs, cats, pigs, and other small animals, but not sufficiently large to allow room for cleaning it. Here various small animals find a hiding-place, and often die. Being out of sight and reach, they are not discovered even when the stench of their decaying bodies becomes distinctly manifest.

All the foul gases engendered in these various ways pass upward into the house, filling every room, condensing in fetid moisture upon the walls, and poisoning all who breathe in the house.

Cellars under houses are rather prejudicial to health, even at best. As they are commonly used, they are very greatly so. If there must be cellars beneath the house, they should be large, light, and well-ventilated. Every week, at least, the cellar windows should be opened wide to allow free change of air. A good way to ventilate a cellar is to extend from it a pipe to the kitchen chimney. The draft in the chimney will carry away the gases which would otherwise find their way into the rooms above.

Cellars should be kept clear of decaying vegetables, wood, wet coal, and mold. The walls should be frequently whitewashed, or washed with a strong solution of copperas. The importance of some of these simple measures cannot well be overestimated.

Houses should be built so high above the ground that the space beneath can be easily cleaned every few months.

Moldy Walls.—Many people who do not appreciate the importance of sunshine as they should, allow mold and mildew to accumulate upon their walls in damp weather, especially in nooks and corners that will be unobserved, never thinking that any harm will come from so doing. Such are ignorant of the fact that each patch of mold is a forest of millions of little plants which are constantly throwing off into the air myriads of germs to be inhaled by the occupants of the house. There is good evidence for believing that the forms of leprosy described in the Jewish law as affecting the house were nothing more than certain forms of mold or fungoid growths which are especially liable to be present in warm countries like the land of Palestine. The description of the so-called "leprosy in the house," together with the proper means to be adopted to remove the difficulty, may be found in Lev. 14 : 36–48.

The mold itself is not communicable to human beings, but as it grows, it throws off into the air myriads of germs which give rise to fermentation and putrefaction, and when taken into the human system, to serious disease.

How many leprous houses may be found now-a-days! The green spots on the wall, the musty odor, and the damp, germ-laden air to be found in many a palatial residence as well as in the spare bedroom and dark parlors of the less pretentious cottages of people of more limited means, are symptoms of house leprosy which, three thousand years ago, would have consigned the infected dwellings to demolition. Are we thirty centuries behind Moses in our knowledge of, and obedience to, sanitary law?

Privies.—As ordinarily constructed and managed, these necessary institutions are most prolific sources of disease. The animal excretions which are left to accumulate in them undergo still further putrefactive changes, which result in the development of the most pestilential germs and gases. Here is where the terrible typhoid poison originates. Deep vaults should never be allowed under any circumstances. The best way to manage a privy is this: Early in the spring fill up the old vault, if there is one, even with the surface. Raise the building a little. Have made at the tin-shop a sufficient number of pails of galvanized iron. The pails should be of the form and size

indicated in Fig. 182. Each should be furnished with a long bail, and a strong handle at one side. In using these pails, fill each half full of fine, dry dirt (not sand) or ashes, and shove it into position, as shown in Fig. 183. By the addition of a little dry dirt two or three times a day, all foul odors will be prevented. The contents of the pails ought to be removed every night in the warmest weather of summer, the pails being replaced with a fresh supply of dry earth. During cooler weather, if little used, the pails will require emptying but once a week, if they are kept well supplied with dry earth. The contents of the pails may be buried or removed to a proper place at a distance from any dwelling or well.

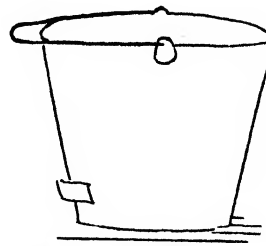


Fig. 182. Pail for use with Dry-Earth System.

For convenience, it is found to be an excellent plan to hire a scavenger to attend to the pails at regular, stated times. Fifteen or twenty in a community can unite, making the expense very slight for each.

Some twenty years ago we succeeded in introducing this plan in various places, and with most excellent results. In many continental European cities the method has long been successfully employed. The same is true in the large cities of Australia and other countries where progress is being made in public sanitation. It is somewhat to our discredit that the Chinese made a practical use of the dry-earth system for many centuries before it was adopted in civilized lands.

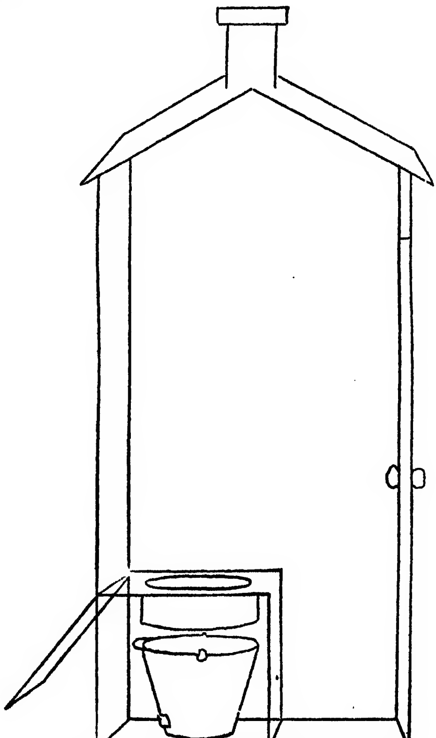


Fig. 183. Dry-Earth Pail in Position.

About the first of December, the pails may be removed and a shallow vault dug. The vault should not exceed two feet in depth and it should not be tightly inclosed. This will allow the contents of the vault to freeze. They may be removed several times during the winter, and should be kept covered with dry dirt, which should be procured in sufficient quantity in the fall.

Persons living in houses connected with sewers, as is customary in cities, incur great danger of injury from an exceedingly active agent of disease known as sewer-gas. Sewers are often unventilated, and become blocked up so that the confined gases find exit through the sinks, wash-bowls, bath-tubs, and water-closets of the houses with which they are connected. It is of the greatest importance that all connections with the sewers should be made air-tight, and should be guarded with traps of the most improved form, so as to make the entrance of sewer-gas impossible. The sewer-pipes connected with the water-closets should be carried directly upward through the roof, and surmounted by a ventilating cap of the most improved form. This plan would ordinarily prevent any great danger from this source. Water-closets should be placed in a part of the building where they will not be likely to contaminate other rooms in the house, should they become foul. They should be thoroughly ventilated.

Barn-yards, Hen-coops, etc.—The close proximity of barn-yards, hen-coops, and hog-pens to human dwellings is a frequent cause of serious and fatal disease. The germs which are developed in the filth abounding in those places, together with the noxious gases constantly arising from the decomposing excreta, are productive of disease when received into the system. Often, indeed, the well from which the family supply of water is obtained will be located only a few feet from a reeking barn-yard, or, as we have more than once seen, the well will, for convenience, be located within the yard itself. In consequence of the proximity, the water of the well will be contaminated by the soluble filth which percolates down through the porous earth and finds its way into the underground veins of water by which the well is fed. See PLATE XVI.

Drains and Cesspools.—Drains, sewers, and cesspools connected with a house are often sources of serious disease. The kitchen sink is not infrequently the door through which the germs of disease silently creep into a household and develop into disease and death, the cause of which remains a mystery and is attributed to the inscrutable dealings of Providence.

In the summer, draughts are produced in the room, which suck up the filthy gases which are formed in the cesspool or sewer, through the drain pipe,—unless it is furnished with an efficient water-trap, which is not usually the case. In the winter, the gases of the cesspool are naturally warmer than the air above, and so they rise and find their way into the house, filling it with invisible poison, which is breathed, and thus taken into the blood, by every occupant of the dwelling. Thousands of valuable lives are annually sacrificed in this way.

How shall this evil be remedied? In cities, the problem is a difficult one, unless sewers can be replaced by the dry-earth system. In the country and in small towns, it is easily cured thus:—

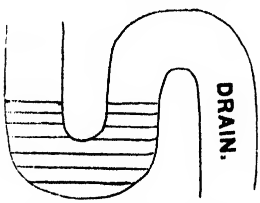


Fig. 184. Trap for Drain.

Make the cesspool some little distance from the house. Place in communication with it a ventilating flue sixteen or eighteen feet in height, and four to six inches in diameter, and surmounted by a ventilator. This will carry off the foul gases under ordinary circumstances, but it will sometimes be found inefficient; hence, a water-trap should be formed in the drain-pipe, just beneath the sink, by bending the pipe so that it will retain constantly three or four inches of water. Fig. 184.

Another good way is to connect the drain-pipe with the chimney or stove-pipe, by means of a pipe of suitable size. This will secure ventilation of the drain, except when there is no heat in the chimney.

Another valuable precaution is this: Pour into the sink two or three times a week a gallon of water in which a pound of copperas has been dissolved. A few crystals of copperas kept constantly in the sink could do no harm. It is very cheap when bought by the quantity. A new cesspool should be made at least once a year or the old one thoroughly cleaned.

Decaying Wood.—While it is now pretty generally understood that decaying substances emit dangerous gases and other causes of disease to which human beings cannot be exposed without danger, it is not so generally known that the same danger accompanies the decay of wood as of other forms of vegetable decomposition.

Feather-beds and Soiled Clothing.—The use of feather-beds may be shown to be detrimental to health in several ways; but we wish to call attention to the fact that they may be a source of contamination of the air immediately surrounding a person during sleep. They not only

themselves undergo a slow decomposition evolving foul and poisonous gases, but on account of their remarkable hygroscopic properties, in which they are equaled by few other substances, they absorb fetid exhalations from the body which are thrown off from the skin during sleep. As this continues often for a long time, the accumulation may become very great, and the feather-bed be converted into a hot-bed of disease germs. As feathers suffer little loss by use, the feather-bed often becomes an heir-loom, and is passed down from one generation to another. The older it becomes, the worse it is. It is somewhat alarming to reflect upon the amount of disease germs which may be stowed away in a sack of feathers which has done service during a hundred years or more. Subject to all the accidents and emergencies of domestic life, it has, perhaps, carried half a dozen persons through typhoid fever, and pillowed the last months of the gradual dissolution of a consumptive, besides being in constant use the balance of the time. Hair, cotton, straw, and husk mattresses are greatly superior to feathers from a hygienic standpoint. By means of a recent invention, felt mattresses are now made which are luxurious enough for any one, and entirely wholesome. From the opportunity we have had of inspecting the use of this kind of mattress, we believe it to be the best for the purpose of anything in use.

The custom, more common in the old country than in this, of allowing soiled clothes to accumulate in closets or other places for several weeks, often becomes a serious injury to health. This is especially the case in the summer season, when under-clothing frequently becomes saturated with perspiration. The odor arising from soiled under-clothing is essentially the same as that which comes from the organic matter escaping from the lungs, and is almost equally poisonous in character. If clothing cannot be washed within a week or two after it has been worn, it should be thoroughly exposed to the sun and air for at least twenty-four hours, by which means it will become sufficiently disinfected to obviate all danger from keeping it a longer time.

House-Cleaning.—The semi-annual house-cleaning, although not a pleasant experience, is just as necessary as the original building of the house. Some important things are often overlooked in the general hurry and confusion.

The closets, garrets, clothes-rooms, stairways, and similar places need thorough renovation, as well as more conspicuous rooms. The steam and gases from the kitchen find their way into all parts of the

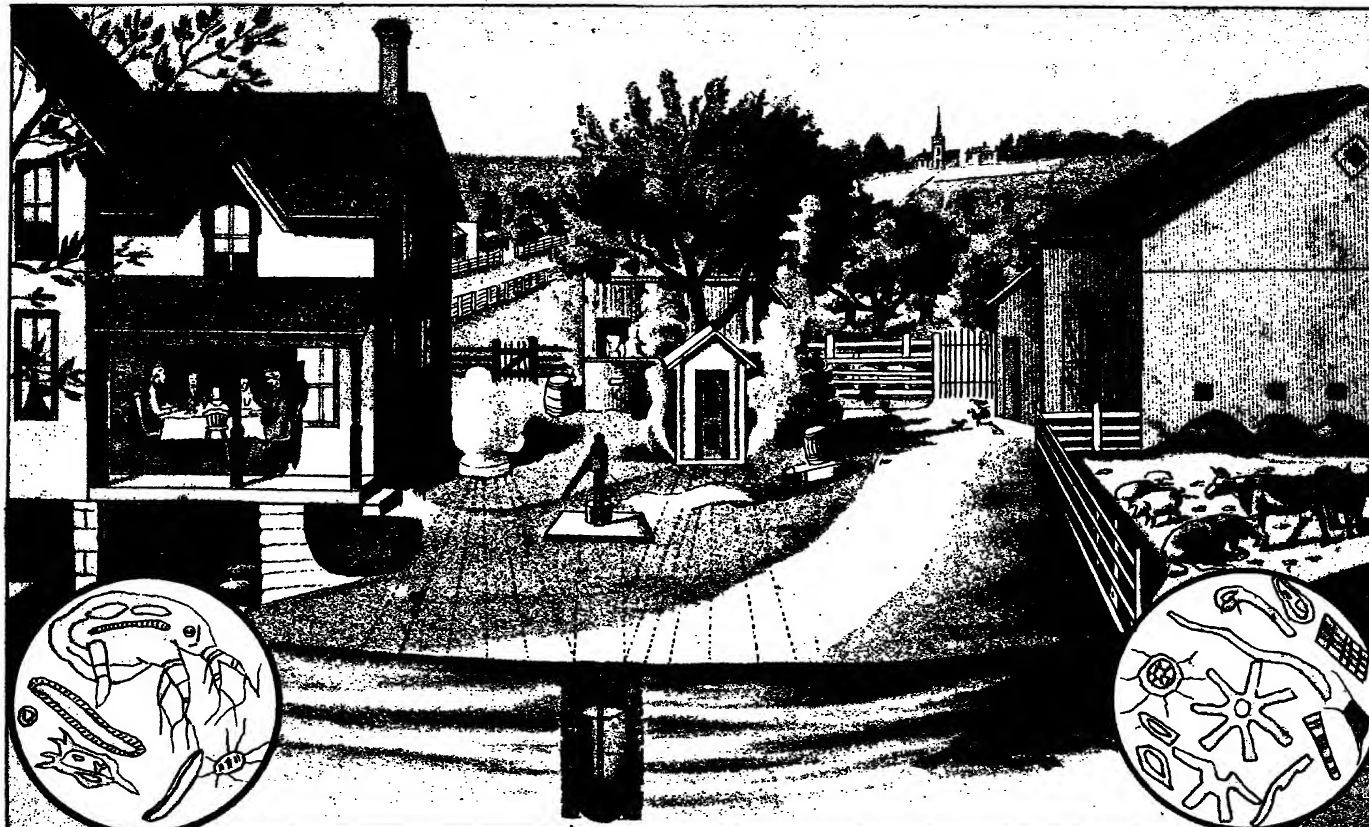
house, and are absorbed by the porous walls, or condense upon the woodwork. If not removed, they become sources of disease. The spare bed-room and the parlor must not be neglected on account of having been little used, for the same reason.

New wall paper should never be put on over old. The fresh paste, by its moisture, causes the fermentation of the old paste and the production of foul gases from the colors of the paper and the impurities which have been absorbed. If the old paper contained arsenic, the danger is increased tenfold, as arseniureted hydrogen is formed, one of the most fatal gases known. House-cleaning is one of the most important parts of domestic labor, and should not be trusted wholly to ignorant servants. It should be done under the constant supervision of an intelligent and thoroughgoing person. A little neglect to examine and thoroughly cleanse every nook and corner may result in the sacrifice of a human life. Too much importance cannot be attached to the necessity of care and painstaking in this matter.

Every dwelling should be thoroughly cleansed at least twice a year. Wood-boxes should be banished from the living-room. Old carpets, with their accumulated dust, should be taken up and thoroughly beaten and cleansed, or better still, exchanged for hard-wood floors, well oiled, and covered, so far as necessary, with loose rugs, which can be removed and shaken every day. Bed-ticks should be refilled; every bed should be carefully examined for vermin, and a general renovation should take place. Fumigation is an excellent means of destroying mold.

Arsenical Papers.—Many cases of poisoning, some fatal, have been traced to the use of wall-papers the colors of which contained arsenic. Window-curtains, paper boxes, and even articles of clothing have become sources of poisoning in the same way. The color of wall-paper which most frequently contains arsenic is green, although many other colors have been found to be contaminated in the same manner. It is almost impossible to find a green enameled paper which does not contain arsenic. The arsenical poison is dispersed through the air in the form of fine dust which is separated from the paper by the rubbing of garments, swinging of picture-frames, and in various other ways. Green window-curtains containing arsenic are particularly dangerous, as the frequent rolling and unrolling of the curtain communicates a large quantity of the poison to the air. It is believed also that the poison of wall-paper may be communicated to the air through the fermentation of the material used in attaching the paper to the wall, which

decomposes the arsenical compound in the paint, producing sulphureted hydrogen, one of the most deadly of all gases. This is especially likely to occur when new paper is put on without removing the old, a practice which can not be too severely condemned. We have seen walls upon which there were from four to eight layers of this arsenical wall-paper. In one case in which the wall already bore five layers of poisonous paper another was being added. Green wrapping paper, even that used in wrapping candies, has also been found to contain arsenic. It may be said that, in general, it is wise to avoid green colors altogether. Although all are not in a high degree poisonous, all are likely to be contaminated and may safely be avoided. It is very easy to test wall-paper before buying, and it would be wise to take the precaution to do so in all cases. The following is the most simple manner of testing it: Place a small piece of the paper—say two or three square inches—in a saucer, and pour over it strong ammonia water. If arsenic is present, it will be dissolved by the ammonia. After leaving it to stand five or ten minutes, turn off the ammonia a little to one side, and drop into it one or two crystals of nitrate of silver. If arsenic is present, little yellow particles of arsenite of silver will soon make their appearance on the crystals of nitrate of silver. Green arsenical papers, when soaked in ammonia water, usually lose their color, or turn blue.



Animalculæ in water.

Living Organisms in Water.

PLATE XVI. AIR AND WATER CONTAMINATION.

VENTILATION.

Ventilation is rendered necessary chiefly by the contamination of the air by the foul and poisonous products of respiration and perspiration, and by the combustion incident to illumination, in the burning of gas, oil, and candles. It consists, essentially, not in absolute removal of all impurities from the air, but in diluting it to an extent sufficient to render it tolerable without producing disease. The amount of air needed for this purpose will of course depend upon the degree or rapidity of contamination. It will be useful for us to consider in this connection the rapidity with which the air becomes impure under ordinary circumstances.

As already stated, a person produces or exhales at each breath one cubic inch of carbonic acid. Since the ordinary proportion of the gas is four parts to 10,000 of air, or two parts to 5,000, and the greatest amount consistent with health is three parts to 5,000 of air, it is evident that a single cubic inch of carbonic acid gas renders unfit for respiration 5,000 cubic inches of air, or at least increases its proportion of impurities to such a degree that it may be breathed but once more without being injurious to the system. As in singing, speaking, when engaged in exercise, even when standing, although not actively exercising, there is a considerable increase in the depth of respiration, or the amount of air respired, so that considerably more than one cubic inch of carbonic acid is exhaled with each breath, while a considerable amount of contamination of the air occurs through the skin, which is not taken into the account, we may safely say that each breath renders three cubic feet of air unfit for breathing again. With this fact as a practical basis, it is very easy to ascertain how long the air in an unventilated room of any given size will remain fit for respiration. Let us take as an example a bedroom 9x10 and 10 feet high, with no means provided for ventilation. There are plenty such to be found. The capacity of such a room would be 900 cubic feet of air, which would all be rendered absolutely unfit to breathe, and in fact poisonous, by a single person breathing it at the rate of twenty respirations a minute for fifteen minutes. Two persons would require but half the time. Two adults and a lamp, or two grown persons, a small child, and a candle, would produce the highest degree of contamination admissible in five minutes. These calculations are of course based upon the supposition that the room under consideration

is air-tight. Fortunately, however, this is not the case, no matter how studiously the architect or builder and the occupants may have endeavored to guard against the possible entrance of a whiff of pure air. The life-giving element will find its way in, even through brick walls and solid masonry, and around the sides of the window-sash, through keyholes, and in every other possible way, though in quantities wholly inadequate to dilute the products of respiration to the point of safety. Examination of the air in crowded theaters has shown that the amount of carbonic acid present is often five to ten times as great as is consistent with safety to health.

A little computation based on these facts will show that each person requires at least 3,000 cubic feet of fresh, pure air per hour to wash away and dilute the poisons poured forth from his own lungs and skin. Any system of ventilation is inadequate which does not supply this amount of air to each occupant of a dwelling, lecture-room, sitting-room, or sleeping apartment. Sick-rooms and hospitals require two or three times as much air as this, on account of the greatly increased amount of contamination.

Plans of Ventilation.—In considering plans of ventilation it must be recollected that this quantity of air must be supplied without exposing persons to drafts of cold air. It is easy enough to get plenty of air, but to get it without drafts is often a problem of no little difficulty, especially in crowded assembly rooms, where a very rapid change of air is often necessary.

Numerous plans for supplying pure air have been proposed and experimented with, and numerous ingenious devices have been adopted for use in special cases; but we have not space to enter into the consideration of these systems, as most of them are especially adapted to the ventilation of large buildings. Our object is merely to point out simple methods by which common dwelling-houses may be ventilated in accordance with the demands of hygiene.

How to secure this 3,000 cubic feet, or more than two hundred hogsheads of pure air each hour, day and night, at all seasons of the year, is the problem which we wish especially to consider. The principles of correct ventilation are very simple, and yet they are so little understood that we have had the accompanying diagrams made, so that by illustration we may make the subject so clear that it can be easily comprehended by all.

Fig. 185 represents a tall glass jar. A short piece of a lighted candle

has been lowered into it by means of a wire with a shallow cup at the end. When the candle was first lowered, it burned very brightly, but in a few seconds it began to grow dim, and in less than half a minute it ceased to burn, sending up smoke, as is seen in the figure, like a candle which has been blown out.

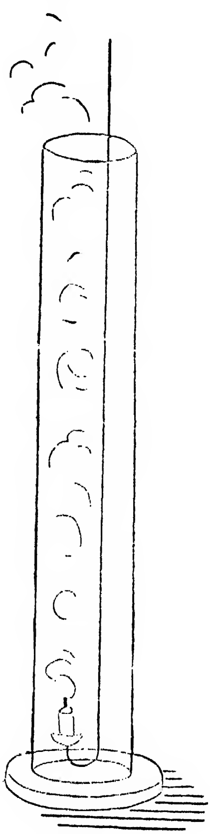


Fig. 185.

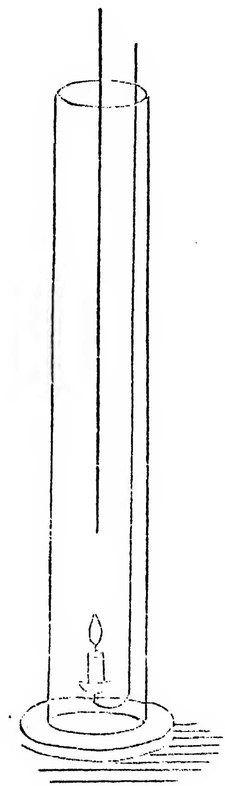


Fig. 186.

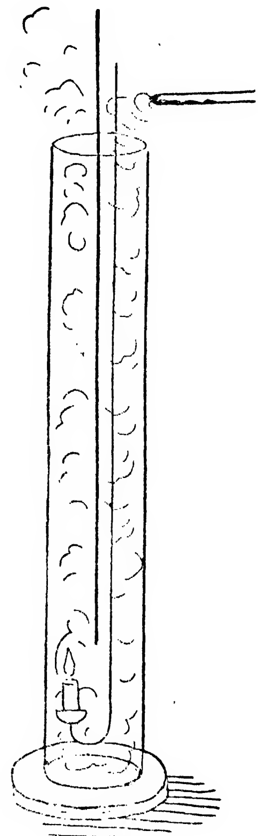


Fig. 187.

The cause of the extinguishment of the candle is the accumulation in the bottom of the jar of carbonic acid. As this gas is incapable of supporting combustion, as well as respiration, the candle is put out by the poison generated by its own combustion. In a similar way, thousands of human beings annually die from the results of their own breathing, self-poisoned. The gas, being heavier than air, settles in the bottom of the jar. By repeating the experiment, and taking a lit-

tle pains, it is possible to obtain the jar quite full of this invisible gaseous poison, which not only extinguishes candles in experiments such as the one described, but puts out the lives of more infants every year than are killed by cholera, the plague, small-pox and yellow fever combined.

Fig. 186 shows the candle burning brightly in the glass jar. If watched closely, it will be seen that it flickers as though it were being blown with considerable violence, which evidently indicates that there is a strong draft, even in the bottom of the tall jar. What makes the difference? The change in the behavior of the candle is wholly due to the fact that we have passed down into the jar, to within a few inches of the candle, a strip of card-board the width of which is nearly equal to the diameter of the jar. By this means two openings are made, one of which allows the heated and impure air to pass up on one side of the card-board, while pure air passes down on the other side. Thus a circulation is made. This is still more clearly seen in Fig. 187, in which a smoking taper is held at the mouth of the jar. It will be observed that the smoke, instead of rising, as it usually does, is drawn down into the tube upon one side of the card-board septum, or partition, being drawn up on the other, showing to the eye that quite a strong draft exists.

The lesson to be learned from these illustrations is that at least two openings are necessary in order that there shall be a draft or change of air. In Fig. 185 it is seen that the candle was extinguished, owing to the accumulation of carbonic acid, there being no draft to carry it away, so long as there was but one opening at the mouth of the jar; but as soon as the partition was introduced, the candle burned brightly and flickered in the draft created. This simple plan is often used in the ventilation of deep mines, a tight partition being built in the middle of the descending shaft. It has happened that the partition in such mines has been destroyed by accident or fire, when the workmen in the mine have either suffered death from suffocation, or barely escaped with their lives. A person shut up in a room with a single opening, as by a window lowered or raised a few inches, is exactly in the condition, so far as his supply of fresh air is concerned, of the candle in the bottom of the jar, or the miner at the bottom of a shaft without a partition. Instead of smothering at once, however, he will suffocate by degrees. The length of time required will depend upon the tightness of the room and the toughness of the individual.

It being clearly shown that there cannot be a change of air without at least two openings,—unless, of course, the single opening be a very large one, through which both an outward and an inward current can be established,—it may properly be inquired, How shall these openings be supplied or arranged? This question may be answered in several ways, a few of which we will now consider.

Window Ventilation.—The conditions required can be rudely secured in any ordinary building by opening two windows, preferably on opposite sides of a room, or by opening a window and a door, or even with one window, in case of necessity, by lowering the upper sash and raising the lower one. A practical question often asked is, How much must a window be raised or lowered in order to secure the proper amount of air? Since each person requires at least 3,000 cubic feet of fresh air each hour, it is evident that each of the two openings must be of sufficient size to allow the passage of that amount of air in the time specified. Allowance must also be made for gas-lights, lamps, candles, etc. A candle should be counted as about half equal to a person, a lamp as equal to one person, and a gas-light as equivalent to six to ten persons. Careful experiments have shown that in order to secure the proper amount of air under ordinary circumstances, without producing unpleasant and dangerous drafts, it is necessary to raise or lower a window of ordinary width one inch for each person. Hence, if the occupants of a room consisted of three persons and a lamp, it would be necessary that the window on one side of the room should be lowered five inches, and on the other side raised five inches.

When a strong wind is blowing, and in very cold weather, the opening may be decreased in proportion to the force of the wind or the degree of coldness. It must be acknowledged, however, that this is a very poor mode of ventilation, at the best. The only reason why we have given it any attention is that it is the only mode that many persons can be induced to adopt, and it is better that a poor method should be used rationally than that those who employ it should be left to go to such extremes as do many persons. We have known people who prided themselves on sleeping in a room in which, in the coldest weather, the wind was allowed to blow a hurricane through windows lowered a foot or two on all sides of the room, when a half-inch opening in two windows would have furnished them with all the air they could possibly make any use of. We have also known many people, —and we are sorry to say that this class of persons much exceeds in

numbers the other class referred to,—who imagined that all the fresh air their systems required could find its way in through the keyhole of the outside door, around the carefully listed window-casings, or through solid brick walls. Fortunately for the latter class, a little air does find entrance through the narrow channels mentioned, else the cases of chronic smothering would be much more frequent than they are. Let us now notice a few of the most common errors in attempts at ventilation; and first we will call attention to some of the evils of window ventilation, the method just described.

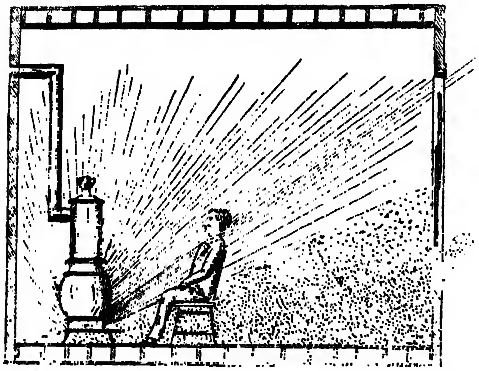


Fig. 188.

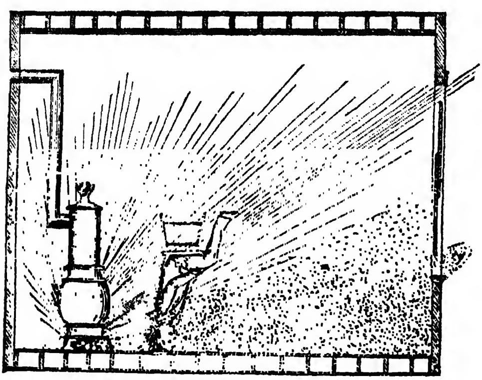


Fig. 189.

Evils of Window Ventilation.—The accompanying diagram, Fig. 188, almost explains itself, so that few words are necessary. It represents a section of a room in which is shown a stove, one window, and a man seated between. The space represented by straight lines is occupied by warm air, which is seen to be passing out at the upper opening of the window. Through the lower opening in the window cold air, represented by the dotted space, is seen to be entering and filling the lower part of the room. The cool air flows along the floor to the stove, by which it is warmed and thus caused to ascend, filling the upper part of the room and passing out at the upper opening in the window, as before noticed. This plan undoubtedly secures to the gentleman who is sitting in the chair an abundant supply of fresh air; but, as is readily seen, it seriously disturbs the distribution of heat in the room, causing an accumulation of the heated air in the upper part of the room, about the gentleman's head, while his feet are surrounded with cold air direct from

out of doors, which is the reverse of what is desirable for health. If the gentleman could reverse his position, without inconvenience otherwise, he would secure good conditions regarding both heat and ventilation.

Chimney Ventilation.—The value of the chimney as a ventilator is much greater than is always appreciated. The old-fashioned fireplace was a most thorough means of ventilation; and even the modern stove, which requires a much smaller quantity of air, is by no means worthless as a ventilator as well as a means of heating. It is possible, however, to utilize the chimney in other and more efficient ways. There are several methods of accomplishing this: one is to carry the smoke-pipe up the whole length of the chimney. By this means the hot smoke and gases in the pipe will heat the surrounding air in the chimney, and create a draft which may be utilized very readily by connecting the chimney with the room to be ventilated. This is probably the best and most economical means of ventilating a small building. By placing the chimney in the center of the house and leading all the smoke-pipes of the house into one central pipe running through the center of the chimney, a good draft may be produced; and by connecting each room with the chimney by means of proper ducts, the most thorough ventilation of the whole house may be secured. A good idea of this method of ventilation may be obtained from Fig. 190.

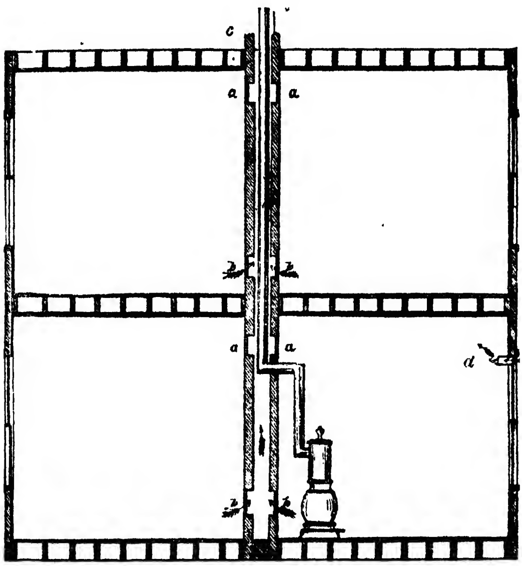


Fig. 190. Best Ventilation. *a* and *b*. Air Registers to let out foul air; *c*. Ventilating-Shaft; *d*. Air Inlet.

Another means of accomplishing the same thing is to have another opening into the chimney besides that for the stove-pipe, through which foul air may be allowed to enter. The objections to this plan are chiefly two: 1. It detracts from the draft of the stove and sometimes causes it to smoke, and hence can only be employed in stoves which have a draft

much stronger than is necessary to carry away the smoke. 2. As downward drafts sometimes occur in the chimney, smoke is liable to enter the room through the ventilator. The latter difficulty can be effectually remedied by placing at the ventilator opening a valve which will allow air to enter the chimney, but closes tightly as soon as there is any movement in the opposite direction. We have arranged a very convenient form of ventilator to operate on this principle, which may be attached to the stove-pipe, and thus save the trouble of making an extra opening into the chimney. The construction of this ventilator may be seen in the accompanying diagram, Fig. 191. This ventilator can be attached to any stove which has a strong draft, and it works very well. We have tried it for more than a year, and with perfect satisfaction. It should be mentioned, however, that it is necessary to close the damper in the ventilator before opening the stove door to replenish the supply of fuel, in order to prevent the smoke from escaping into the room from the stove.

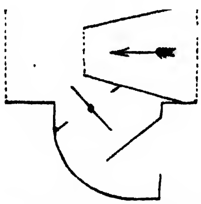


Fig. 191. Stove-pipe Ventilator.

Like all other modes of ventilation dependent on the draft of a chimney or shaft, this mode is good only when the chimney is heated, or while the fire is burning. Hence a constant fire should be maintained wherever it is in use, night and day. While there are some objections to this plan of ventilation, its simplicity and ready applicability to houses in which the common stove is used, as a means of securing good ventilation, are so great as to recommend it most strongly to the common people. In order to increase the efficiency of the ventilator described, and to complement its action in the removal of foul air by the ready introduction of pure air in such a manner as to secure immunity from drafts with an abundant supply of pure air, a simple plan is the following: Have constructed a box about six inches deep, three inches wide, and of a length exactly equal to the width of the window casing inside. Instead of making the box with a tight bottom, make the bottom consist of wire cloth with rather coarse meshes. Put on the top a hinged lid, with some simple arrangement at the side by which the lid may be raised or lowered at pleasure, and fastened at any point. The apparatus is now complete; and all that is needed to secure the admission of air without drafts, even in very cold weather, is to place this box in the top of the window-opening, lowering the upper sash a little for the purpose. The box should be placed with the bottom outward, being

allowed to project a little beyond the sash, and with the opening of the lid directed toward the ceiling. By this means the current of air which enters the room will be so modified as to prevent unpleasant and harmful drafts. The wire screen will break its force and divide it into a great number of small currents. The hinged cover will direct the air upward toward the ceiling, whence it will be directed toward the floor; and as it settles it will be warmed by the air of the room which is always warmer near the ceiling than elsewhere in the room. This will bring the cool air about the head, where it is needed, and will prevent the accumulation of cold air around the feet, which most need extra warmth on account of their remoteness from the center of the body. By opening or closing the cover, the size of the opening may be regulated to suit all sorts of weather. When the weather is extremely cold or a very strong wind is blowing, a mere crack may be sufficient to give entrance to all the air needed. When possible, one or more windows should be provided with such openings on different sides of the room, by which means disturbances caused by changes in the wind could be easily corrected. The box can be readily adapted to windows of different sizes by making it shorter than the width of the casing and placing in each end a movable piece which can be slid out to close any space left at the ends. The opening made between the two sashes by the lowering of the upper sash may be closed by listing or cotton, or by a long strip of pasteboard covered with felt and fitted to the sash. This will not be needed except in the very coldest weather, as the air which enters through the sash will be given an upward direction, and so will not be likely to be felt. For cut of inlet box see Fig. 192.

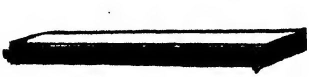


Fig. 192. Air-Inlet Box.

Ventilating-Shafts.—Large houses heated by furnaces, or by steam or water pipes, must be provided with ventilating-shafts extending from the basement to above the roof, and connected with each room of the house by ducts with openings of sufficient size to secure thorough renewal of the air as often as necessary to answer the requirements of hygiene. As already suggested, the most economical way of ventilating by means of a shaft, is to convey the smoke from stoves or furnaces by means of a smoke-stack, and to place this in the center of a large shaft, the air of which will thus be heated and a draft produced. The almost universal fault in constructing ventilating-shafts is to make them too small, or to make the openings into them

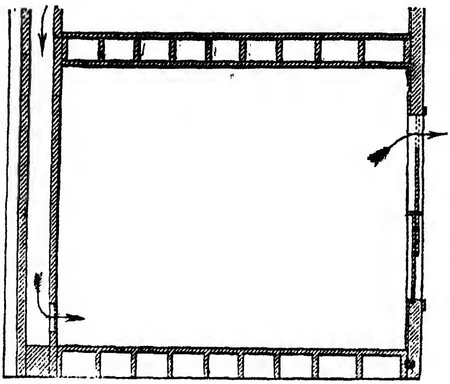


Fig. 193. Ventilation Working Wrong Way.

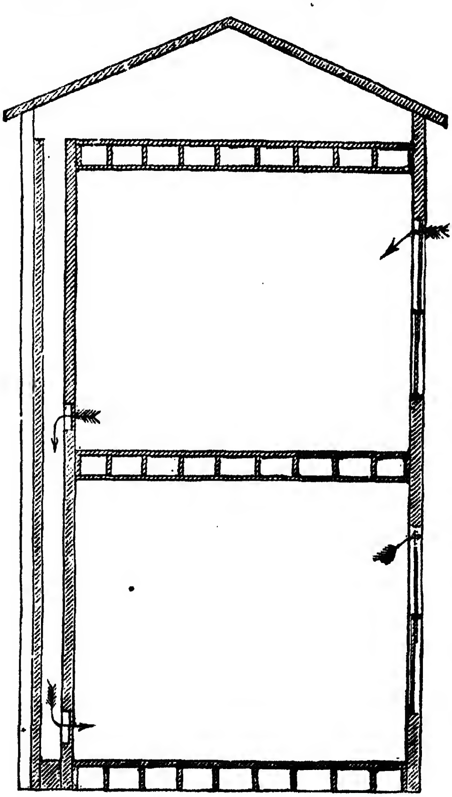


Fig. 194. Diagram showing Defective System of Ventilation.

insufficiently large. Ample ventilating space should be provided. Better have too much space than too little. It is also important that every room in the house should be connected with the ventilating-shaft or chimney. Cellars, pantries, clothes-rooms, closets, and halls, though usually neglected, should receive first attention with regard to ventilation.

A very common error is the supposition that nothing is required to secure a draft but an upright shaft. A cold shaft will "draw" when a strong wind is passing over its top, but the current will vary with the wind, and is likely to be downward as well as upward, as is shown by the accompanying diagram, Fig. 193. We have even known cases in which the ventilating-shaft, instead of passing through the roof and thus communicating with the open air, ended in the garret, as shown in Fig. 194.

A ventilating-shaft, in order to draw well, must be heated to a temperature of 50° to 75° F. above that of the room to be ventilated, and should be surmounted by some device to prevent interference with the draft from downward cur-

rents of wind. Two openings into the flue should be made from each room. The lower one should be used constantly, and so need not be made to close; but as the upper one is to be used only to clear the room of air quickly when it has been over-heated, it should be made to close, and should be opened only when necessary for the purpose named.

Heating.—The tendency of Americans is to keep their living-rooms at too high a temperature. In England the usual temperature is 58° to 60° F., rarely more; but in this country it is more common to find the rooms of dwellings heated to from 70° to 80° F. It is probable that the drier atmosphere of this country makes a higher temperature necessary; but the usual temperature maintained is quite too warm. The effect of so high a temperature is to render the skin delicate and the system very susceptible to injury from the numerous changes to which our climate is subject. The proper temperature is 60° to 65°. A few old people may require 70°; but the temperature should not be allowed to exceed that degree. The greater the heat to which the body is accustomed, the less the power of resisting cold, and vice versa. We have often found invalids who had been confined for some time in an atmosphere in which the thermometer stood at 90° F., as we found upon testing it, and yet they complained of chilliness, insisted on having every window tightly closed, and shivered whenever the door was opened or a breath of fresh air admitted from any source. If a temperature of 65° is uncomfortably cool at first, the difficulty may be relieved by the addition of more clothing, or by taking more exercise. Abundant exercise in the open air is the best means of hardening the body to a low temperature.

It is important that the heating and the ventilating apparatus should be so arranged as to assist each other. Hence, the best heating apparatus is the one which will maintain an equable temperature the most easily and with the smallest expense, while at the same time helping the ventilation. The old-fashioned fire-place was a splendid ventilator, but as it utilized only about one-tenth of the heat produced by the combustion of coal or wood, wasting the balance, economy forbids its use in cities by any except the wealthy, though it may be used where fuel is cheap, and is employed to some extent. It is also open to the objection that it requires much labor to take care of it, to furnish fuel and to keep free from dust and ashes the apartments heated by it. The improved forms of grates economize heat very greatly, but

lose much more heat than the most improved forms of stoves. They are to be recommended as excellent means of heating. The objection sometimes made that radiant heat is not healthful, is without foundation. Radiant heat is the kind furnished by the sun, which is undoubtedly the best of all means of heating. There is no reason why it should not be healthful; and the fact that it will warm a person sitting before a fire-place while he is breathing cool air, is a recommendation well worthy of consideration. The most serious objection against the fire-place as a heater is that it is inadequate to warm comfortably very large rooms in extremely cold weather. This may be in part, but not always wholly, remedied by using several fire-places in one room, but this is not always convenient, and increases the ventilation out of proportion to the heating of the room, so that it is very expensive. A most excellent plan is to combine the stove and fire-place in large rooms. Let the fire-place be placed in the inside wall, and the stove at the outer side of the room. The stove will thus supply the additional heat necessary, while the fire-place acts as a ventilator as well as a heater. For almost any room usually found in dwelling houses, the plan last suggested, combined with the plan proposed for admitting fresh air through a box placed at the upper part of the window, will be found sufficient to secure the proper degree of heat and an abundant supply of pure air.

The porcelain stoves of Germany certainly secure an equable temperature, but they in no way assist ventilation. Indeed, in the efforts to retain their heat as long as possible, the windows and doors are carefully guarded in cold weather, so that as little cold air as possible shall find entrance. The air-tight stoves of America and some other countries are not so good as heat retainers, but they are usually no better as ventilators, though excellent heaters. It is possible, however, to convert almost any ordinary stove into a most efficient means of helping ventilation, by connecting with it a pipe bringing fresh air directly from out of doors. The inner end of the pipe should communicate with a chamber attached to the stove body in such a way that the fresh air may be warmed as it enters. This plan may be understood at a glance by referring to Fig. 195. By combining with this plan the stove-pipe ventilator elsewhere described, all the requisites for good ventilation may be obtained. Care should be observed to locate the ventilator so that the fresh air may not pass immediately to it and be carried away before being used. As in the case of furnaces,

great care should be taken that the outer end of the fresh-air duct terminates where pure air can be obtained. Fresh-air inlets should often be examined, as dead rats and other nuisances often contaminate the air at its entrance through these channels.

Moistening of the Air.—Although there has been much discussion upon the subject, there is good evidence for believing that the addition of moisture to air which is unusually dry is a matter of great importance to persons in health, as also to those suffering with certain forms of disease, particularly pulmonary difficulties. The air should not be saturated, but should contain sufficient moisture so that it will not cause unpleasant dryness of the throat, eyes, and skin. The requisite amount of moisture may be obtained by evaporation of moisture in open vessels upon the stove, in a pan provided for it in the furnace, by means of moistened linen cloths or sponges placed before registers, and in a variety of other ways. Attention to this point is particularly necessary in winter, when out-of-door air, on account of its low temperature, contains a much smaller proportion of moisture than at most other times.

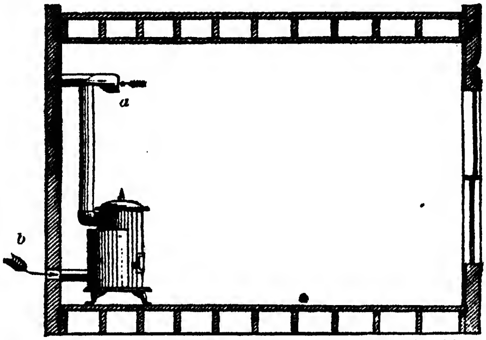


Fig. 195. Stove-pipe Ventilation. *a.* Stove-pipe Ventilator; *b.* Inlet for Pure Air.

Night-Air.—In conclusion, we must say one word respecting the popular dread of night-air. The notion that night-air is not always as pure as day-air, has been ridiculed by some writers on health, but we think without just cause, as there seems to be evidence for believing that there is some foundation for the popular fear of night-air. During the day, the layer of air nearest the earth is heated by contact with the soil warmed by the solar beams, and rising, it carries upward with it the noxious vapors and germs which are chiefly generated near the surface of the ground. When the sun sets and the earth cools by radiation of its heat into space, the poison-laden air sinks down near the surface again, along with fogs and heavy vapors. Hence, a person is more likely to contract malarial disease by inhaling night-air in the vicinity of swamps or other malarious localities.

This fact must be borne in mind, however, that night-air is all the air we have at night, and must be breathed, if we breathe at all. The air in dwellings is night-air, as well as that which is out of doors, at least, the small quantity of air contained in dwellings at sunset must be through doors and windows and other openings speedily changed so as to be precisely like outside air in character. The recommendation of the late Dr. Hall to shut up sleeping-rooms as closely as possible several hours before sunset, and to keep them closed during the night, so as to have a supply of day-air for use during sleep, was most harmful and pernicious. He argued that as a person takes in at each breath but twenty cubic inches of air, a single small roomful of air would easily last during the seven or eight hours of sleep. This he demonstrated to his satisfaction by a simple mathematical proposition. The doctor, like many others, evidently overlooked the fact that one respiration renders air unfit to breathe, not by using up its oxygen, but by poisoning it so that it becomes unfit to breathe. As already explained, each breath, though consisting of but twenty cubic inches of air, and containing but one cubic inch of carbonic acid, on account of the organic poison contained in it, poisons three cubic feet of air; so that a single person would really consume, or render unfit for respiratory food, as much air in thirty minutes as would fifteen persons in eight hours according to Dr. Hall's erroneous calculation. The best that can be done in the night is to secure as good air as there is, which will be found in the upper rooms of the house, since they are farther from the ground. The fear of night-air should deter no one from ventilating sleeping-rooms during the night, as during sleep more air is needed than at any other time, on account of the increased quantities of poisonous products given off from the skin and lungs during repose. It is this fact which makes it especially necessary that beds and bedding should be thoroughly ventilated every morning. If possible, they should be exposed to the rays of the sun and fresh air for two or three hours, at least, daily. The windows of a sleeping apartment should always be widely opened every morning, and the disinfecting air and sunshine allowed to perform their sanitary labors unrestricted by blinds and curtains.

DISINFECTION.

As air contamination is often the result of causes which cannot be remedied by ventilation alone, disinfection becomes necessary as an auxiliary, though no amount of disinfection can take the place of an abundant supply of fresh air. Substances liable to produce contamination by undergoing putrefactive decomposition should be removed to so great a distance from human habitations as to obviate all possibility of danger. In case this cannot be readily done, and often when it can be done, in order to prevent contamination during transit, the dangerous substance should be rendered innocuous by the use of disinfectants. Disinfectants are of two classes: those which simply destroy the offensive odors of putrescent substances, or *deodorants*, and those which not only destroy the odors, but the substances themselves, or check or prevent putrescent changes. The most of these are known as *antiseptics*. We will call attention to some of the best and most easily used disinfectants, and the conditions to which they are especially adapted.

Dry Earth.—This is one of the best of all deodorants for solid and semi-solid matters. It is a most excellent agent for deodorizing excreta. It operates by absorbing fluids and foul gases. It must be very dry, and the finer the better. Sand is not good. Earth, if wet, is worthless. Dry powdered clay is best. Coal ashes act mainly on the same principle, and are good. Dust from the road is a very good material. It should be gathered and preserved in boxes under cover, in readiness for use in wet weather. Dry earth must be used very freely to be effective.

The popular idea that dry earth, pulverized charcoal, and other substances possess the property of absorbing diseased matter from the air, is an error. These substances are valuable chiefly as absorbents liquids; the more finely divided, the more effective they are.

Chloride of Lime is excellent to destroy putrid substances, foul gases, and disease germs. Its efficiency is due to the chlorine gas which escapes from it when moistened.

Into a gallon of water, put a pound of fresh chloride of lime. (Be sure it is fresh. It is about worthless when old.) Stir well. Filter, or turn off after settling. Use freely.

This is an excellent preparation for cleansing clothing that has been soiled by the discharges of patients. For this purpose, use one quart of the solution described to half a pailful of water. It is also very useful for cleansing the hands of nurses who may be employed in cases of loathsome or infectious disease. After preparation, the solution must be used at once or kept tightly stoppered.

Chlorine Gas.—This is one of the most effective of disinfectants. It may be prepared in several ways. The following are simple and practical methods:—

1. With one and a half pounds of fresh chloride of lime mix one pound of powdered alum. This is excellent to use in a sick-room where foul odors are present, as the chlorine is given off gradually.

2. Mix equal parts of chloride of lime and muriatic or sulphuric acid. Mix in an earthen vessel with water equal to the acid by measure.

3. Mix together in an earthen vessel equal parts of salt and black oxide of manganese, and pour on two parts by weight of sulphuric acid.

About a pound and a half of chloride of lime, or of the mixture of salt and oxide of manganese, with the proper amount of acid, will be required for each one hundred cubic feet of air to be disinfected. In using chlorine to disinfect rooms which have been occupied by fever patients, all colored fabrics, picture-frames, and other articles likely to be injured, should be removed, and the room tightly closed for twenty-four hours, after which it should be aired for two or three days. In disinfection after scarlet fever and diphtheria, everything used about the patient should be left in the room.

As the irritating fumes of this gas may be inhaled by accident, it will be useful to know that they may be antidoted by the inhalation of ammonia, or better, by breathing the vapor of alcohol.

Sulphurous Acid.—This well-known bleaching agent is also a very good disinfectant. It is even preferable to chlorine gas for disinfecting rooms and clothing, if used thoroughly. It may be used for disinfection in the same manner as for bleaching purposes. After removing from the room everything that may be discolored by a bleaching agent, as all kinds of colored cotton fabrics, and getting all in readiness to close the room quickly and tightly, place in an old iron kettle some live coals, upon which throw the sulphur or powdered brimstone, setting the kettle on bricks, or in a tub with a little water.

Another convenient method is to place in the middle of the room, on a piece of sheet-iron or boards, a few shovelfuls of wet sand. Place in the sand several bricks near together, and on the bricks two or three hot stove-covers, bottom upward. Put the sulphur on these, and there will be no danger of fire. A hot iron kettle answers equally well. Use six ounces of sulphur to each one hundred cubic feet of air to be disinfected. Close the room tightly for twenty-four hours, then ventilate for two days, and scrub and repaper the walls.

Ozone.—This is nature's great disinfectant. It is produced by various natural agents, such as electrical discharges, the gums of certain forest trees, the perfumes of flowers, and a great number of other means which are in constant activity, keeping good the supply which is exhausted by the destruction of the noxious vapors, germs, and various other agents destructive to human life which teem the air. The value of this wonderful agent as a disinfectant is but just coming to be appreciated in some small degree. It is to be hoped that ere long some means will be devised by which it can be cheaply manufactured in great quantities, when it may be made the means of doing an incalculable amount of good ; as, for instance, in destroying the poisonous emanations from swamps, marshes, and other sources of atmospheric poisons.

Peroxide of Hydrogen.— This chemical preparation is somewhat analogous to ozone in its properties. It differs from ozone, however, in the fact that it is very soluble in water, so that concentrated solutions may be easily made by proper chemical means. Peroxide of hydrogen possesses the remarkable property of setting free active oxygen when brought into contact with organic substances whereby these substances are consumed. It will not attack to any extent the living tissues of animals, unless in very concentrated form, but will destroy germs of all sorts, together with the organic matter which supports the life of germs. When applied to a discharging sore or introduced into an abscess, a great quantity of foam appears, indicating that the peroxide is actively doing its work. Dilute with three to ten parts of water.

Carbolic Acid.—This is a reliable disinfectant if employed in a sufficient quantity, but it is rarely used in such a manner as to be effective, too weak solutions being used. A five per cent solution, or one part of carbolic acid to nineteen parts of water, is necessary for the destruction of dangerous germs.

Corrosive Sublimate.— The most efficient of all known germicides, which are available for ordinary use, is corrosive sublimate, a chemical agent often employed by housewives in the destruction of certain kinds of vermin. Most germs are killed by the application of a solution of one part corrosive sublimate in four thousand parts of water. Even weaker solutions are effective for the destruction of certain kinds of germs. A strong solution, however, is needed for the certain destruction of some dangerous germs which are very tenacious of life. A 1-2000 solution of corrosive sublimate is made by the addition of one-half dram of corrosive sublimate to a gallon of water. Solutions of this powerful poison should never be kept on hand, owing to the danger of fatal accident, especially in homes where children and ignorant persons are likely to come in contact with it. It is better to have a number of half-dram powders put up at a drug-store ready for use when needed. If a solution must be kept ready for use during the care of a case of typhoid fever, it should be tinged with some coloring matter, as cochineal, which will serve as a warning against its use, and the jug or bottle containing it should be labeled "Poison," and should be kept carefully out of the reach of persons likely to be harmed. The nature of this chemical agent is such that it cannot be kept in metal vessels. If placed in tin vessels, the tin coating is quickly destroyed, hence such solutions must be kept in glass or earthen-ware vessels.

Dry Heat.—A temperature of 300° is destructive to nearly all germs. Unfortunately, however, this temperature, when maintained for a sufficient length of time to render certain the destruction of all germs, is likely to seriously damage the texture of many fabrics, hence this mode of disinfection is not in very great favor. It may be employed, however, for the disinfection of many objects which cannot be safely exposed to the action of chemical agents or water. Objects requiring disinfection by this mode may be placed in an oven, care being taken to place in the oven with the article to be disinfected, a bit of dried bread or a piece of white paper, by watching which the degree of heat and liability to injury may be determined.

Boiling. — This is one of the most convenient of all modes of disinfection, since it is always ready to hand, and can be employed at little or no expense. Nearly all germs are killed by boiling for thirty minutes to one hour. All germs dangerous to life, or so-called "disease germs," may be readily destroyed in this manner. Most germs are killed by boiling for fifteen to twenty minutes, but boiling for thirty

minutes to an hour is the safer plan. It should be remembered that boiling water is not a disinfectant. Heat in connection with moisture is the disinfecting agent, consequently it is necessary that a boiling temperature, which is ordinarily something less than 212°, should be maintained for the time mentioned to insure thorough disinfection.

Cleansing Sick-Rooms. — A room which has been long occupied by a person suffering from chronic disease, or by a fever patient, or a case of smallpox or other contagious disease, ought to be very thoroughly cleansed before being occupied by others. The means by which this may be most efficiently done are these: —

1. Take out the windows, and give the greatest possible freedom to ventilation.

2. Remove the old paper from the walls, and burn it. Wash the bare walls with a solution of copperas, and then apply whitewash to the ceiling. Cleanse the woodwork with a solution of chloride of lime, one pound to the gallon.

3. Remove the carpet from the floor, the bedding from the bed, and every other fabric from the room, and thoroughly disinfect them before replacing.

Ordinary scrubbing, whitewashing, and ventilation are useful and necessary, but are not sufficient. Disinfection is required. One of the most convenient and effective means of disinfection is fumigation by the burning of common sulphur. The following is the best method of doing this: —

Into a tub or a large dish-pan pour water to the depth of an inch. Place in the vessel two bricks laid flatwise and near together. Set upon the bricks an old iron kettle. Put into the kettle a proper quantity of flour of sulphur mixed with an equal quantity of pounded charcoal. The quantity required is four pounds for each one thousand cubic feet of air. Mix with the sulphur and charcoal a few pieces of newspaper. Before the sulphur is lighted, all clothing and other articles in the room should be so disposed as to allow the fumes of the sulphur to come in contact with them to the fullest extent. The efficiency of the fumigation is also very greatly increased by saturating the walls, and everything the room contains, with steam. This may be very readily done by boiling water vigorously upon a stove in the room for an hour or two previous to lighting the sulphur. Dry sulphur fumes will destroy growing germs, but not the dried spores which may be collected upon walls and in cracks and corners. When all is in readiness, light the sulphur, and leave the room as soon as it is evident that it is going to

burn well. If the door of the room communicates with other rooms, the crack around the door must be tightly closed by pasting thick paper over it. The room must be kept closed for twenty-four hours, at the end of which time it should be opened and left to air for another twenty-four hours, when it may be considered thoroughly disinfected.

Disinfecting Clothing. — Clothing which has been exposed to contamination by contagion, if of little value, should be destroyed. If more valuable, it may be disinfected in any one of several ways: —

1. Heat in an oven as hot as possible without scorching, for an hour or two. A temperature of 250° will do no harm.

2. If the clothing is uncolored, or colored with mineral dyes, soak a few minutes in a solution of fresh chloride of lime of the strength of one pound of the chloride to a pailful of water. Afterward boil.

3. Soak for half an hour in boiling water to which carbolic acid has been added in proportion of an ounce to the gallon of water. Boil again in pure soft water, to remove the smell of the acid.

4. Expose for several hours, in a close box, to the fumes of burning sulphur. Air thoroughly afterward, and wash.

Combating Germs in the Sick-Room. — The part played by germs in the causation of many diseases, is now so well understood that it is not necessary to call attention to evidence bearing upon this important fact; but information respecting methods of combating germs is always of the greatest practical importance. We wish here to call attention to the importance of taking measures for the destruction of germs during the course of a contagious disease.

It is generally supposed that when a person has once been infected by a disease, he is infected as much as possible, and it is of no use to take further precautions against infection or contagion; but the frequent occurrence of relapses in persons who have almost recovered from a contagious malady, as diphtheria or typhoid fever, points clearly to the conclusion that a patient may be re-infected in some way. Common sense suggests that a patient suffering from scarlet fever or diphtheria, must be infecting himself continually by breathing contaminated air. It has been observed for many years, and by the most eminent physicians, especially military physicians, that persons suffering from contagious diseases recover much more surely and rapidly when treated in an open shed or tent, even when suffering many disadvantages, than in the best-constructed and most perfectly appointed hospitals. The reason for this is obvious. The air of an open tent or shed is changed so frequently that there is no accumulation of

the poisons which are thrown off from the lungs and the skin of the patient, and hence the air is practically free from contamination.

Recognizing this fact, physicians and nurses have undertaken to purify the air of sick-rooms by various means. Good ventilation has been proved to be of the greatest value as a means of dispersing the germs; but no value whatever attaches to the use of disinfectants in the room with a patient, such as chloride of lime scattered about, carbolic acid evaporating in a basin of warm water, the burning of disinfectant pastiles, etc. It is possible, however, to do much in the direction of destroying germs in the sick-room, and thus supplying the patient with air of greater purity, and hence with a better opportunity for recovery. Two rooms should be devoted to the patient. They should be near together, and should both be accessible from the hall or a communicating room, so that each can be used independently of the other. These rooms should be used on alternate days. On leaving the sick-room which has been occupied last, in the morning air thoroughly by opening windows as wide as possible. The next morning, transfer the patient to the disinfected room, and proceed to disinfect the other room in the same manner. This method is the only one which is of any value while a room is in use. The accumulation of disease germs often results in the reinfection of the patient, and of course greatly increases the danger of the attendants.

It should be remembered that most germs in a sick-room are to be found upon the walls, ceiling, and floor. One of the most efficient methods of removing them is by rubbing the walls with moist bread. This method was introduced by Prof. Virchow, of Berlin. Bichloride of mercury, chloride of lime, and other antiseptics may be used to good advantage.

How to Destroy Typhoid Germs.—Typhoid fever is usually communicated through the discharges of typhoid-fever patients. The germs of the disease find their way to wells, water courses, and other sources of water supply, and thus other persons become infected. This means of spreading the disease would be wholly checked if the discharges of every typhoid-fever patient were properly and thoroughly disinfected. A saturated solution of copperas or sulphate of zinc will probably destroy the germs of typhoid, but there are other more positive means of disinfection. The following is among the most valuable:—

A solution of two drams of corrosive sublimate to the gallon of water, will destroy all known germs. The objection to this disinfectant is that

it is so poisonous that any one is likely to be killed by accidentally swallowing even a very small portion of the solution.

Disinfection of Spittoons and Cuspidors.—The disinfection of spittoons is a matter of importance to which sanitarians have recently called attention. When the contents of a spittoon are allowed to dry and become powdered to dust, there is great danger of contamination of the air and communication of various maladies through this means. This is especially the case with consumption, now generally recognized as a contagious disease. It is probably more contagious than leprosy, although the fact is as yet little understood by the public. All persons suffering from any disease requiring expectoration, should be compelled by law to avoid expectoration elsewhere than in a spittoon or upon some object which may be disinfected or destroyed. Spitting upon the floors, in the streets, and upon public walks is a crime against society, and should be prohibited by law. The plan which we recommend in cases of consumption and other contagious diseases, is that the patient should expectorate upon cloths or little paper spittoons which can be burned; but if a spittoon or cuspidor is employed, it may be disinfected by pouring into it a quantity of boiling water equal to twice the volume of the contents of the spittoon. Spittoons should always be thoroughly disinfected with boiling water when cleansed, and should be cleansed every day, or, if necessary, several times a day, whether their contents are supposed to be specially infectious or not.

Disinfection of the Hands.—For disinfection of the hands, which often becomes necessary through contact with persons suffering from loathsome or infectious disease, or dead bodies, or other source of probable contamination, the following is a simple and effective method : First scrub the hands thoroughly with hot water, laundry soap, and a nail brush, being careful to give special attention to the spaces under the ends of the nails, which are a common hiding-place for many dangerous germs, and the cause of the occasional serious consequences which arise from a scratch with the finger-nail. After thorough scrubbing of the hands, bathe them for one or two minutes in a strong solution of alcohol. Without drying the hands, bathe them for another minute with a solution of corrosive sublimate, a dram to the gallon of water ; afterwards rinse thoroughly with pure water. Any portion of the surface of the body, although not too large a portion at the same time, may be treated in the same manner. Of course great care should be taken to avoid getting corrosive sublimate into the mouth or eyes, as it is a very deadly poison.

RATIONAL REMEDIES FOR DISEASE.

In this portion of this work we shall consider such methods and means of medical treatment as may be safely trusted in the hands of unprofessional persons, and such as all should be familiar with, not only to enable them to apply efficient remedies in the absence of a physician, but to render them capable of using under the direction of a wise physician those remedies which are generally conceded to be in the great majority of cases the most efficient of all remedial measures when intelligently and thoroughly applied.

Before entering upon the consideration of remedies, we must become acquainted with the nature of disease, and the relation of remedies to the system. For ages, the true principles relating to these two important subjects have been buried beneath the rubbish of empiricism, dogmatism, ignorance, and superstition ; but the wonderful advances in all departments of science during the present century, and particularly in medicine and its collateral sciences, have thrown a flood of light upon the subject, and made clear much that was once dark and mysterious. The microscope, in its wonderful revelations regarding the lower forms of life and the structure of the human body and the changes which it may undergo in disease, has contributed not a little to this result.

What Is Disease ?—This question has been variously answered at different times in the history of the science of medicine. Among the ancients the prevailing notion was that disease was the result of the direct influence of evil spirits who took possession of human beings and inflicted upon them various sufferings. They observed that when a man was sick, his temperament and disposition were wholly different from what they were in health. The hale, hearty, jovial man became not only emaciated and pale, but morose, fretful, and sad. They also observed the violent contortions which were sometimes manifested under the influence of severe pain. Men were far more superstitious then than now. They attributed the most trivial occurrences, which were mysterious to their untutored minds, to some supernatural agency, just

as many people do in modern times. Their conclusion was that disease was the work of demons, who were allowed to harass and persecute men by possessing their bodies and subjecting them to all manner of tortures.

Entirely consistent with their opinion of the nature of disease was the mode of treating disease in vogue with the ancients. If the cause of a man's sickness was an incarcerated demon,—which they supposed was the case,—the proper remedy would evidently be to get the Satanic lodger out in some manner, if possible. To effect this very desirable end, various methods were used, all of which were more or less connected with certain mysterious religious rites, the secret of which was confided to a few individuals, usually the priests. In this way the priests became physicians—quacks, we would say now-a-days—and the professions of theology and medicine became mingled, the early superstitions of the former being permanently grafted upon the latter. One very approved method of getting rid of a demon was to draw him out through the nose of the patient after applying a certain root to the nostrils. A method much more severe for the patient was flagellation, which either ended in the departure of the devil or the death of the victim. Bathing in certain waters, inhaling the air of particular caves, and similar measures, were also regarded as efficient remedies.

These ancient notions of disease are still preserved with all their original superstitions in some of the dark corners of the earth, as is well illustrated in Dr. Richardson's interesting description of the physician of Thibet. We quote the following from his interesting essay, "The World of Physic":—

"In the month of September, when the day breaks over his magnificent mountains, watch this man leaving his Lamasery to collect his remedies. A leathern bag and a tea-kettle carry all his wants. Armed with a pointed iron-capped staff and hook, like a Druid of our own old time, he marches forth with his train of pupils, and roaming the mountains, picks out of the laboratory of nature his medicinal stores, from branch, from shrub, from root. With the declining sun he returns, laden with his spoils, next day culls them, dries them in the air, packs them, labels them, stores them in some safe garner of the quiet Lamasery, and, in his honest soul, believes that the wealth of the whole medical world is in his safe keeping. Called to the couch of the sick or the dying, he is content to hear of pain, to read off signs of oppression, and, striking his fingers across the pulse of each wrist, as a musician doth the strings of his instrument, he is satisfied. The phenomena he sees are

with him easily understood; they are the assaults of a demon who must be expelled. So many diseases, so many demons, and, let it not be doubted, so many remedies. From the wonderful pouch by the side of that physician, come forth those dried plants he gathered on the mountain side, and down the throat of the afflicted certain of them go, in nauseous powder. Or, should the remedy not be in the pouch, this wonderful Lama physician, with more than homeopathic skill, writes the name of the remedy on a scrap of paper, moistens the paper with his lips, rolls it into a pill, and administers it to the faithful, who, straightway swallowing, with the earnest belief that the name is as good as the thing when it comes through proper hands, believes and lives, or believes and dies, as the case may be.

"But before the last event shall happen, be the patient rich enough to bear the operation, our good Lama has one or two other resources at hand, belonging to the imaginative, which resources are bold, and, in proportion as they are bold, effective. By that most convenient of theories, that every disease is a demon within the man, the good Lama has a power to which we civilized have no claim. Between the actual existence of a thing, and firm faith in that existence, whether it be or not, the gulf is narrow in all minds, absent in most; and so, the Tartar patient is, to his physician, as good as a man who should have veritably of veritably a demon within him. Well, I put to you here, to all, what would you wish for most if you believed as firmly that you had a demon in your tooth, making it ache, as that you had a tooth to be made to ache? I suspect you would like to have the demon cleared out. Further, if you were a Lama physician, and knew the quality of the demon, and his best mode of exit, you would, I think, attempt to remove him. Our Lama sympathizes. He says to his patient, 'I can get rid of this demon by certain magical prayers, but you, being a wealthy man, are afflicted with a very proud demon, in fact, quite a swell demon, and he will not go away unless you find him a thorough good horse to carry him off.' And so the horse is brought out, properly accoutered, the prayers are recited, and then, the demon getting inside the horse, and the physician outside, they go away together, and unless the demon leaves the horse, or the physician disposes of both, demon and physician remain as intimate as is proper so long as the horse lives. Where the demon goes afterward I cannot say: I suppose, to his native place."

To Hippocrates, a physician who flourished several centuries before the Christian era, more than to any other physician of ancient times be-

longs the honor of discovering that climate, food, and personal habits have far more to do with diseases than any Satanic or other supernatural agency. His notion of the exact nature of disease, was, however, quite too absurd for credence, although it involved a true principle. He believed that there were certain humors in the body which play an important part in the functions of the body. According to his views, when these humors are in just the right proportion, health is the result; if any one of the humors is in excess, disease follows. It will be noted that the primary idea in this theory is that disease results from disarrangement of the body.

But although this noble old physician labored very zealously to uproot the superstitious notions of disease, he was successful only with a few of his most intimate disciples. The unlearned masses still clung to their old fallacies; and notwithstanding the great advancement which civilization and enlightenment have made since then, we find the same erroneous dogmas in the world at the present day, though in a somewhat modified form. People no longer regard a sick man as one possessed with a devil, but the prevalent opinion would seem to be that it is an evil entity of some kind which settles down upon or into a man and works all manner of mischief. In descriptions of fever we are often told that the patient was "attacked," "carried through," etc.; or that the doctor "combated the disease," until the "fever left him."

As before remarked, the microscope has done much to solve the mystery connected with this subject. This wonderful little instrument has shown the human body to be made up of minute elements, each of which has a life of its own more or less independent of the lives of other elements with which it is surrounded.

Although it would be presumptuous to assert that the whole mystery of life is yet revealed, it is now well known to all scientists that what is usually termed life, that is, the phenomena of animal existence, is merely the combined result of the individual lives of the microscopic cells of which all living bodies are composed. That these cells have an independent life is proven by the fact that they will retain their life and vitality for hours after the death of the individual.

In the human body these cells are separated into groups, forming organs, each of which has a certain definite and peculiar function to perform. Thus, one set of cells form the muscles, and by their united action produce all the movements of the body. Another set form the liver, and have the function of removing certain impurities from the

blood. Still another collection of cells make up the brain and by their action produce thought, while other cells form the nerves, which serve the purpose of conveying impressions to and fro between the brain and the external world.

When all of these cells are acting harmoniously, each performing properly the work belonging to it, the whole body is in a state of health. Hence we say, It is not only the business of the cell structures of the body to do all the work of life, but they are also required to keep themselves and the body in repair. Every thought of the brain, every transmission of an impression by a nerve, every contraction of a muscle, occasions the destruction of millions of the delicate constituents of brain, nerve, and muscle. If they were allowed to go unrepaired, those organs would soon lose their power of action, and death would result.

Health is that condition of the body in which each organ performs its proper function. It is the harmonious action of all the bodily organs.

Through the influence of various disturbing causes, the harmonious action of the organs of the body is sometimes interfered with. The action of some may be accelerated, while that of others is impeded or wholly interrupted; and even the structure of organs may be impaired. This disturbance or derangement is accompanied by discomfort and unpleasant sensations.

This condition of the body is disease; which may be defined, in brief, as a *derangement of the bodily functions or structures.*

Disease is the exact opposite of health. The one is normal, the other abnormal. The one is harmonious action, the other is discordant action. The one is physiological, the other pathological. There may be all grades of departure from normal or healthy action, as well as all degrees of impairment of structure, short of actual destruction, which is death. It has been asserted that disease may be either purely functional or purely organic; but there is good reason to question whether there can be any disturbance of function without some degree of structural derangement; and it is certainly impossible that there should be injury of structure without impairment of function.

The abnormal action of an organ, occasioned by a disturbing cause, is in most cases an effort on the part of the organ to recover its normal condition by removing, if possible, the cause of the disturbance. Viewed in this light, disease may be called *remedial effort,* since it is an effort to remedy an existing evil. For example, snuff taken into the nose

occasions sneezing; and how? Snuff is an acrid, irritating poison. When it touches the delicate membrane of the nose, it is at once recognized as something which ought to be ejected. By means of the nervous connection between the mucous membrane of the nose and the muscles of respiration, the latter are induced to act in such a way as to forcibly eject the offending substance by a gust of air from the lungs. Thus the evil is removed; and the effort of removal was a remedial effort. Since it was an abnormal action, or one not performed in the regular and healthy action of the organs involved, it was disease.

If some offensive substance, as tobacco, ipecac, or sulphate of zinc, is introduced into the stomach, that organ speedily recognizes its obnoxious character, and, acting with the abdominal muscles, expels it by a strong, spasmodic effort, called vomiting. This action is a remedial one, and is really disease.

A person inhales the virus of small-pox, by which means his blood becomes filled with poisonous germs. In a few days he begins to suffer numerous disturbances, has a high fever, and presently a characteristic eruption of the skin. All this disturbance is an effort of nature to expel from the body the poisonous virus which was originally taken into the system, and which was generated therein by propagation.

From the fact that disease is so often remedial effort, some have taken extreme grounds respecting its nature, claiming that disease is always remedial effort. The fallacy of this theory is at once apparent when the attempt is made to apply it to a large class of diseases known as *organic*, such as the various degenerations of muscular, nervous, and other tissues, tumors, cancerous formations, and other morbid growths. In no sense can these forms of disease be called remedial.

The Medical Pathies.—From the earliest periods in the history of medicine down to the present, there have always been sects in medicine as well as in theology. Practitioners have differed in their modes of treating disease in accordance with their varying ideas of the nature of disease and the relation of remedies to the human system. In modern times, the agitation incident to the overthrow of many cherished dogmas in medicine held from the remotest ages, has developed a greater degree of diversity of opinion on medical subjects than has ever existed at any previous period. We have not time to notice at length all the various medical doctrines of the age, nor to point out in detail what we consider the fundamental errors upon which they are severally based. Neither would we desire to do so, as our object in this work is not to

make a belligerent attack upon any class of people, professional or non-professional, but rather to inculcate true principles in relation to health and disease, the soundness of which must be admitted by all classes alike. In pointing out, however, what we believe to be the true relation of remedies to disease, and the best modes of applying remedial measures, it will be necessary for us to notice in a very general way some of the principal modes of practice in modern times. The different modes of practice which have existed in modern times and are still in vogue to a greater or less extent, for convenience of consideration may be divided into four general classes; namely, 1. The Artificial; 2. The Exclusive; 3. The Expectant; 4. The Rational.

The Artificial Method.—What has been termed the Artificial Method of treating disease consists in the application of means—chiefly drugs—with the idea that they possess a direct controlling influence upon various maladies by means of which the same may be expelled from the body. Acting under the belief that disease was something within the body to be expelled, the votaries of this method naturally considered it necessary to attack the morbid entity with an energy in proportion to its gravity. It was this belief which led the leading practitioners, in fact the greater share of all medical practitioners, of the last generation, to employ in their practice remedies, or rather measures supposed to be remedies, of a character so depressing to the vitality and so dangerous to health that they have been at the present time almost wholly and universally discarded. This mode of treatment is undoubtedly a modern relic of the ancient notion, to which attention has already been called, which supposed disease to consist of a malign entity which must be expelled from the body by measures proportionate in violence to the malignity of the incarcerated demon. The notion of demoniacal possession has, of course, disappeared in the light of the revelations of modern science, but the method of practice originated and perpetuated by this ancient and now exploded notion of disease still survives. This method has been termed, though incorrectly, by the disciples of Hahnemann, the Allopathic method in contradistinction from their own or the Homeopathic method. Fortunately for the world, this method of practice is rapidly disappearing, and there is every reason to hope that, like the ancient notion which gave birth to it, it will soon be buried in the oblivion of the past. That such a result would not be undesirable is openly admitted by the leading members of the medical profession in all parts of the world. The men who stand in the front rank of scientific

medicine everywhere teach at the present day doctrines quite opposed to those held by their predecessors. The artificial method is thus described by Prof. Jacob Bigelow, M. D., of Harvard University: "The destructive tendencies of disease and the supposed proneness to deterioration of nature herself were opposed by copious and exhausting depletion followed by a shadowy array of alteratives, deobstruents, and tonics. The confinement by disease which might have been terminated in a few days was protracted to weeks and months; because the importance of the case required, as it was thought, that the patient should be 'taken down' and then artificially 'built up.'

"Artificial medicine undermined the strength, elicited new morbid manifestations, and left more disease than it took away. The question raised was not how much the patient had profited under his active treatment, but how much more of the same he could bear. Large doses of violent and deleterious drugs were given as long as the patient evinced 'tolerance' of them, that is, did not sink under them. The results in such cases, if favorable, like the escapes of desperate surgery, were chronicled as professional triumphs, while the press was silent on the disastrous results subsequently incurred in like cases by deluded imitators. If diseases proved fatal, or even if they were not jugulated or cut short at the outset, the misfortune was attributed to the circumstance of the remedies not being sufficiently active, or of the physician not being called in season. A considerable amount of violent practice is still maintained by routine physicians who, without going deeply into the true nature or exigencies of the case before them, assume the general ground that nothing is dangerous but neglect. Edge-tools are used as though they could never be anything more than harmless playthings. It is thought allowable to harass the patient with daily and opposite prescriptions; to try, to abandon, to re-inforce, or reverse; to blow hot and cold on successive days; but never to let the patient alone nor intrust his case to the quiet guidance of nature. Consulting physicians frequently and painfully witness the gratuitous suffering and continued nausea, the prostration of strength and prevention of appetite, the stupefaction of the senses and the wearisome days and nights which would never have occurred had there been no such thing as officious medication. What practitioner has not seen infants screaming in the pangs of hunger, or of stimulants remorselessly applied to their tender skins, and whose only chance for relief was in the continued routine of unnecessary calomel and ipecacuanha."

The same author further states that blisters, antimonial ointments, salivation, etc., may continue to afflict the patient long after the disease is gone. The effects of powerful depletion are felt for months, and sometimes for years. "The enormous polypharmacopœia of modern times is an excrescence on science, unsupported by any evidence of necessity or fitness."

Many extracts similar to the above might be quoted, but, fortunately for the world, the methods of the artificial school are now less frequently employed, so that the criticisms offered by Dr. Bigelow will not properly apply to any entire class of physicians at the present time, although it is quite likely that in districts remote from the great centers of medical thought and progress, there are still to be found practitioners of the old-fashioned type, which as a class have disappeared, pursuing the obsolete methods of their forefathers.

Exclusive Method.—Under this head are included all of the various medical sects which have claimed to be able to cure all diseases by a single method or by the employment of one or a few remedies. The method comprises Homeopathy, Hydropathy, Eclecticism (in the usual application of the term), Physio-medicalism, and many others too numerous to mention. Many patent nostrums and secret remedies are included under this class, claiming, as they do, to be panaceas for all the ills which flesh is heir to.

Each one of the exclusive systems undoubtedly contains elements of truth, some presenting much truth and little error, others much error and very little truth. All, however, embody the fundamental error that diseases may be cured by the application of some one principle or a few remedies. Homeopathy has, undoubtedly, accomplished a great amount of good in demonstrating that in a large share of cases, at least, extremely minute or infinitesimal doses of medicine are as efficient if not more useful in the treatment of disease than the huge doses and "heroic" practices almost universally in vogue at the time when homeopathy came into existence. It is not remarkable that the wide contrast between its small doses and palatable medicaments and the vile, nauseating mixtures employed in the artificial method should have won for it a large following and increased popularity, even at the present time when it is well known that not more than one in a hundred of homeopathic physicians confines himself to the principles enunciated by the founder of the system. So, also, hydropathy has accomplished a work for which the world has not yet learned to be sufficiently grateful, al-

though the present indications are that the whole system, stripped of its exclusive character, will be grafted upon all other systems of practice alike. In its exclusive form, hydropathy has doubtless done much harm. We cannot believe, however, that, notwithstanding all the ignorance and fanaticism of some of the earlier advocates of the "cold-water cure," one-tenth as much harm has been done by this exclusive method of practice as by the artificial methods of treatment before described, which, according to Dr. Coggswell, of Boston, have been "productive of vastly more evil than good," and which, according to the eminent Dr. Rush, of Philadelphia, have not only "assisted in multiplying diseases," but also "increased their fatality." Electro-therapy, like hydropathy, originated with men whose views of medical science were limited and inaccurate; and its failure to accomplish what was claimed for it as an exclusive remedy, brought it, like hydropathy and all other exclusive remedies, into disrepute with the more enlightened part of the profession. Through scientific investigation, however, both electro-therapy and hydro-therapy, or hydriatrics, have been placed upon a rational basis, and have thus been shown to contain a large proportion of truth in spite of the many erroneous notions and properties connected with them by their earlier advocates.

The Expectant Method.—The unfavorable results of the artificial method of treatment, and the uncertain and often disappointing results of the exclusive methods, have given rise to a great amount of skepticism on the part of many observing people respecting the merits of all modes of treatment, out of which has grown what may be termed the Expectant Method of treatment, which consists in simply giving to the patient good care and nursing, withholding all active measures of treatment in the belief that every case of disease is either incurable or has a direct tendency toward recovery; and that all remedies are clearly useless in averting death or shortening the duration of human maladies. This method has never attained to any very great popularity, and never can secure a large number of followers, since it is directly opposed to the popular notion of disease and the almost universal belief in the efficacy of remedies. Even those who have been when in health its warmest supporters, when themselves suffering with serious disease, have nearly always deserted their favorite theory and resorted for relief to the same measures as those of less skeptical tendencies. The expectant method of treatment has, however, in the cases in which it has been employed, demonstrated beyond room for question that certain diseases at least have a natural tendency

to recovery, and are influenced by remedial measures in a much smaller degree than has been almost universally supposed. Numerous experiments in the expectant treatment of various maladies have been made in various European countries and also in this country, and in not a few instances experimenters have declared that the results obtained when no active remedial measures were employed were equally good with those obtained from the most active medication. It is to be said, however, with reference to those experiments, that the expectant method has usually been compared with a mode of treatment closely allied to, if not identical with, that described as the artificial method; and hence it is not surprising that the patient when left to himself with no attention except proper care and nursing has suffered less, and made a more rapid recovery, than when tormented by various irritating and depressing agents applied with an idea of combating the morbid entity at work in his organism. Although this method of treatment has sometimes been described as "a meditation on death," yet it must be said in its favor that if the choice were between it and the old-fashioned artificial method of practice believed in by our forefathers and still to some extent in vogue, the preference would be decidedly in favor of the expectant method. On this point Dr. Jacob Bigelow, president of the American Academy of Arts and Sciences, and professor in the medical department of Harvard University, in a work published a few years ago, stated as his sincere belief that "the unbiased opinion of most medical men of sound judgment and long experience is made up that the amount of death and disaster in the world would be less if all diseases were left to themselves than it now is under the multiform, reckless, and contradictory modes of practice, good and bad, with which practitioners of diverse denominations carry on their differences, at the expense of their patients."

Said Sir John Forbes, M. D., F. R. S., "Some patients get well with the aid of medicine, more without it, and still more in spite of it."

Says the Dublin *Medical Journal*, "Assuredly the uncertain and most unsatisfactory art that we call medical science is no science at all, but a jumble of inconsistent opinions, of conclusions hastily and often incorrectly drawn, of facts misunderstood or perverted, of comparisons without analogy, of hypotheses without reason, and of theories not only useless but dangerous."

Said Dr. Bostwick, author of the "History of Medicine," "Every dose of medicine given is a blind experiment on the vitality of the patient."

Said James Johnson, M. D., F. R. S., editor of *The Medico-chirurgical*

Review, "I declare as my conscientious conviction founded on long experience and reflection, that if there was not a single physician, surgeon, man-midwife, chemist, apothecary, druggist, nor drug, on the face of the earth, there would be less sickness and less mortality than now prevail."

Prof. J. W. Carson, of the New York College of Physicians and Surgeons, says, "We do not know whether our patients recover because we give them medicine or because nature cures them. Perhaps bread-pills would cure as many as medicine." The eminent Dr. Alonzo Clark, a professor in the same medical college, states that "in their zeal to do good, physicians have done much harm; they have hurried many to the grave who would have recovered if left to nature;" and that "all of our curative agents are poisons, and, as a consequence, every dose diminishes the patient's vitality."

Prof. Martin Paine, of the New York University Medical College, asserts that "drug medicines do but cure one disease by producing another," a sentiment with which the late Prof. Liebig, the well-known German chemist, agreed.

The foregoing paragraphs place in a very strong light the erroneous principles of the artificial method condemned in such strong terms by Dr. Bigelow. It must not be supposed, however, that the authors whose names are mentioned were total skeptics as regards the use of all remedies, or as regards the use of drug remedies. They only wished to combat the popular error that remedies cure, and that drugs are harmless agents, to be swallowed on every pretext. All of these eminent men, together with leading scientific men in all parts of the world, were and are believers in what has been most appropriately called—

Rational Medicine.—The outgrowth of scientific investigation of the nature and causes of disease and the relations to the human body of the various external agents which may be brought in contact with it, has been the development, out of the chaos and confusion of the "war of the pathies," of a method of dealing with the human system when subject to disease known as the Rational Method. This system recognizes no universal remedy for disease and no universal law of cure. It confines itself to no one order or class of remedies or methods. It includes and recognizes all useful remedial agents, no matter when, how, or by whom discovered, which have been by experience proven to be of real value in the treatment of disease. It avoids exclusive systems and ideas, but accepts all that is really valuable in all. It is in the fullest and truest sense eclectic in character. Its principles may be concisely stated as follows:—

1. Nature alone possesses the power to heal.

2. Any agent which will assist nature in effecting a cure is a remedial agent, and may, under proper circumstances, be used as such.

3. Remedial agents affect the system beneficially, not through their own operations upon it, but through the reactions of the living tissues upon them.

4. All remedial agents involve in their application the expenditure of the vitality of the patient, some more, some less.

5. The best remedies are those which will render the most remedial aid with the least expense to the vitality of the patient.

6. Patients, not diseases, are to be treated.

7. There is in nature no antidote for the results of the transgression of physical laws.

Upon these few principles all true medical philosophy and practice are based; and the success or want of success of any particular method of treatment wholly depends upon the degree to which these principles are recognized and applied. In order to render them more intelligible to non-professional readers, for whom principally we write, we will consider each of these principles more at length.

1. *Nature alone possesses the power to heal.*—That the true healing power resides in nature is established by a great number of facts, many of which are admirably presented in a work by Sir John Forbes, editor of the *British and Foreign Medical Review*, entitled, "Nature and Art in Disease." The author clearly proves that nature is the real healing power by the following facts, which he ably presents:—

(1) Wild animals suffer the most serious injuries and are frequently affected by epidemic diseases, and yet recover without artificial aid. The same is true of domestic animals in a somewhat less degree, since they are sometimes subject to medical treatment. It is suggested, however, that such treatment as is usually employed has no effect whatever, or is detrimental rather than beneficial. Such treatment as placing in the stall of the sick animal branches of the wych-elm, tying to its tail colored threads, or making a slit in the sick creature's ear with a pair of rusty scissors, could certainly have very little curative effect.

(2) Among savages and semi-civilized nations, medical treatment is either not employed, or consists of such absurd procedures as could not possibly be of any benefit, consisting in many cases of charms, incantations, and other measures equally harmless to produce any appreciable effects.

(3) Many cases have occurred in which persons have suffered with serious maladies, such as fevers and other acute diseases, when isolated or otherwise unable to obtain medical advice, and yet have made excellent recoveries.

(4) Many experiments have been made by physicians in different countries in the treatment of diseases by inert remedies for the purpose of studying the natural history of disease. In many cases, results have been so favorable as to give rise to the gravest skepticism as to the efficacy of remedial measures. The writer mentions the case of a celebrated professor, who, on being told that a new sect had sprung up—the homeopathists—which cured diseases by infinitesimal doses of medicine, replied that he had long been in the habit of doing more than this; namely, curing diseases by none. At the present time there are very few eminent physicians who do not hold to this view, and it is probable that there can scarcely be found anywhere an intelligent physician who would attempt to defend the strange and absurd views of Cumming on this point, who is said to have exclaimed in his lecture-room, "As for nature, I would treat it in the sick-room as I would a squalling cat,—open the door and drive it out;" but it is not doubted that the following of such pernicious teaching has given rise to a large share of the erroneous, unscientific, and unsuccessful medical practice of the last century.

2. *Any agent which will assist nature in effecting a cure is a remedial agent, and may, under proper circumstances, be used as such.*—As before remarked, the rational method is wholly opposed to exclusive treatment. It accepts any remedy which experience has shown to be of real value in the treatment of the various maladies to which mankind is subject. The proper test for any method or plan of treatment proposed is, "Will it aid nature in restoring a sick person to health?" If this question can be answered in the affirmative, this remedy may be employed, no matter how when or where it was originated or discovered.

3. *Remedial agents affect the system beneficially, not through their operations upon it, but through the reactions of the living tissue upon them.*—This proposition, although directly opposed to the notions generally entertained by non-professional people, is abundantly sustained by scientific evidence. The contrary view, namely, that remedies operate directly upon the system, originated in the erroneous views of the nature of disease, which supposed it to be an entity of

some sort to be attacked and driven out by energetic measures. This fallacious view, having been entertained at a time when many of the current expressions relating to disease and its treatment were being formulated, has been perpetuated by them; and it is probably due to this fact that it is so extremely difficult to uproot from the popular mind, and even from the average professional mind, the absurd doctrines which were long since exploded by scientific investigation. A thorough understanding and ready acceptance of this proposition is insured by a knowledge of the properties of vital or organized tissues and the relations of inert or inorganic matter to organization. A few illustrations may be necessary to make this point perfectly clear to the ordinary reader. We will begin with examples of the simplest kind and proceed from them to more complex examples.

Food is said to nourish the body. The expression with reference to it apparently supposes that the food is the active agent and that the body is acted upon by it; yet the most superficial study of the process of nutrition clearly demonstrates that the body alone, with its organs, is the active agent, the food being wholly passive. When received into the body, the food is subject to processes of digestion, in which it does not act, but is acted upon by the teeth, stomach, intestines, and various digestive juices which come in contact with it. After being reduced to a fluid condition it is still further acted upon, being absorbed and thus received into the blood, from which it is taken up by the various vessels, carried into various parts of the body and converted into tissue, and thus utilized. Through the whole process the food is acted upon, not in a single instance appearing otherwise than as a wholly passive substance. Water, one of the most important elements of nutrition as well as a powerful remedial agent, when taken into the system is acted upon by the blood-vessels, tissues, and various other parts of the body, and thus made to subserve useful ends, but in no instance does it act upon living parts. The same may be said respecting air. It is received, absorbed, assimilated, and finally expelled from the body in connection with carbon, a waste product. It, too, is wholly passive.

Now let us observe that the same relation exists between the living tissues and remedial agents which may be applied to them. Let us suppose, for instance, that a person swallows some substance which is said to act as an emetic. When received into the stomach, it is recognized as something which cannot be utilized, and as obnoxious to

the tissues. The inherent tendency of the body to maintain itself in a normal condition by keeping its various parts free from obstructions and irritating elements, occasions the action of the stomach and accessory parts upon the foreign substance received, which results in its expulsion. The feeling of nausea which precedes the expulsory act is an expression of the repugnance of the system for the obnoxious substance received, and the expulsory act known as vomiting, which is said to be the effect of the emetic, is evidently nothing more nor less than a vigorous effort on the part of the system to rid itself of the irritating and unusable substance. Any substance which is thus treated by the stomach is called an emetic. The substances rejected in this manner by the system are said to possess emetic properties, although it is evident from the facts to which we have just called attention that the emetic properties, so-called, are due to the manner in which the substance is recognized by the system, rather than to any action upon the system by the emetic substance. In like manner, we may easily see that substances called diuretic are simply those which occasion an increased action on the part of the kidneys by being expelled by them. Scientific physicians understand this fact perfectly well, though for convenience in referring to diuretics, they speak of the drug as though it acted on the kidneys. Many persons undoubtedly believe that sweet spirits of nitre, juniper, and other well-known diuretics, act upon the kidneys, but scientific physicians entertain no such idea.

A cathartic is a drug which is expelled by the intestines. Any substance which occasions an increased activity of the skin, or perspiration, is called a diaphoretic. If we should consider each one of the properties of different medicines or remedial agents, we should find that in each case the medicinal property, so-called, is expressive of the manner in which the system acts toward the remedy rather than any action of the remedy itself. The remedy which occasions only one kind of action has one property, while a remedy which occasions numerous actions or disturbances in the body possesses many properties.

It is important that this point should be clearly understood and always kept in mind in the application of remedies in the treatment of disease, as many serious errors in practice may thus be prevented.

4. *All remedial agents involve in their action an expenditure of the vitality of the patient, some more, some less.*—This proposition follows as a natural result from the preceding. While a person receives

strength and nourishment from the digestion of food, it is nevertheless true that vitality is expended in the process of digestion. So with all of the other nutritive processes. In the circulation of the blood, in respiration, and all other vital actions, vitality is being constantly used up or expended. An agent which increases any of these actions necessarily increases vital expenditure.

5. *The best remedies are those which will furnish the most remedial aid with the least expense to the vitality of the patient.*—It would need no argument to convince a merchant that he would derive the most profit from the sale of goods for which he could obtain the highest price and which he could purchase at the lowest figures; or the farmer that he would derive the greatest gain by raising crops for which he could obtain the largest pecuniary returns with the least outlay of money and labor in raising. It is equally evident that the best remedies to use in the treatment of the sick are those which will secure the desired results with the least expenditure of vitality on the part of the patient. What these remedies are we shall point out in another connection.

6. *Patients, not diseases, are to be treated.*—To some, this proposition will appear absurd, while to others it will appear equally unnecessary. That the proposition is neither absurd nor superfluous is abundantly proved by the most casual examination of the many modes of treatment which have been in vogue during the past, as well as some of those still employed to a greater or less extent at the present time. Not a small proportion of the average practitioners, when called to see a patient, in considering the symptoms of the case and the indications for treatment, consider less the patient himself than the name and nature of the disease with which he is suffering. It is a common custom with many non-progressive physicians, and with the laity almost altogether, to treat diseases by their names. If a person is suffering from any given disease, he is at once advised to take some remedy which is said to cure that disease. The particular remedy prescribed will depend largely on the prevailing fashion at that particular time or place. It is, in fact, the disregard of the principle above stated which has led to what are termed fashions in medicine, the existence and evil results of which are fully recognized by the more intelligent physicians everywhere. It has not infrequently happened—indeed, we believe occurrences of the sort to be more common than we would dare to suggest—that some acute or chronic diseases have been treated with the result of successfully curing

the disease, but with equal success in destroying the patient. "Cured to death," might justly be written upon many a tombstone placed over graves whose occupants were said to have died of various maladies which were far less responsible for their death than was the "heroic" treatment to which they were subjected. Nothing can be more unscientific, or more unsatisfactory in its results, than the ordinary routine of "treating" diseases. Any plan of treatment, to be successful in aiding nature in the relief of human suffering and the prolongation of human life, must regard the conditions and interests of the patient, rather than the name or nature of the disease from which he is suffering. We need not delay longer upon this point as it will be reverted to at greater length elsewhere.

7. *There is in nature no antidote for the results of the transgression of physical laws.*—This proposition, too, will doubtless be warmly disputed, especially by those who imagine that all existing things were made for the special benefit or advantage of man, and that everything may, by proper investigation, be made subservient to his interests. We believe, however, as was remarked to us by the learned editor of one of the leading medical journals of the West, that "there is no more dangerous popular error than that it is possible for a person to violate *ad libitum* the laws which relate to his physical well-being, and then avert the natural penalty of his transgression by swallowing a few doses of medicine, or by resorting to any other remedial measure." Remedies may postpone, for a time, the results of physical transgression, and may even seem to prevent them altogether, but careful observation will show that the escape from punishment is only apparent. Its form may be modified, but it cannot be averted entirely. A person who squanders his vital force will certainly die prematurely. If his career is not cut short by some acute malady, he will be worn out by some chronic disorder.

Rational medicine teaches that every physical transgression must be visited by commensurate punishment, and that the proper work for the physician is to instruct people how to escape the penalty of transgression, not only by averting the penalty after the liability to it has been incurred, but by giving warning, by proper instruction, of the certainty with which suffering and possibly death result from a disregard of nature's laws, and thus preventing transgression.

THERAPEUTIC AGENTS OR REMEDIES FOR DISEASE.

We are now prepared to enter upon the consideration of the different classes of therapeutic agents which are or may be employed in the treatment of disease. In considering this subject we shall endeavor to point out the excellences or disadvantages of each class, and shall give special preference and prominence to those remedies which are particularly adapted to the use of non-professional persons, touching very lightly those agents which should be employed, if at all, only by the trained physician.

In this consideration we shall divide all remedies into two classes, under the respective heads, "Hygienic Agents" and "Medicinal Agents."

HYGIENIC AGENTS.

Under this head we shall consider the remedial properties and applications of *water, air, light, heat, electricity, exercise, food,* and *mental influences.* These agencies are termed *hygienic,* because they are not only useful in disease in aiding in the restoration of health, but are also essential to the maintenance of life and health at all times. Of all the remedies employed in the treatment of disease, these are the most important, and will receive first attention for the following reasons :—

1. Because a great share of the maladies to which human beings are subject arises from disturbances in the relations of these agents to the human system, which only need to be regulated to effect a cure of the disease.

2. Because they sustain to the vital organs friendly rather than hostile relations, and harmonize with its processes in a most admirable manner.

3. In consequence of these facts the remedies comprised in this class are those which are least expensive to the system, since they will accomplish the results desired with the least expenditure of vitality. On this account they are to be recommended above all others, and should be employed to the exclusion of all others when accessible, and when they are capable of meeting the requirements of the case in hand. That we are not alone in this view of the merits of hygienic remedial agents, or hygeio-therapeutics, we might show by numerous

references to the teachings of eminent medical instructors, were it necessary; but so general has the admission of this truth become, that we need not weary either ourselves or our readers with quotations upon the subject. One or two references will suffice as illustrations of many.

"It is the duty of the physician to restore health by the simplest means in his power."—*Prof. S. G. Armor, M. D., of the Long Island Medical College.*

"Hygiene is of far more value in the treatment of disease than drugs."—*Prof. Willard Parker, of the New York College of Physicians and Surgeons.*

Let us now consider in detail the merits and modes of application of each one of these agents.

WATER.

In order to understand the relations of water to the system as a remedial agent, we must become acquainted, in some degree at least, with its physical properties. Water exists in three states; viz., as a solid, in the form of ice; as a liquid, its most common form; and as a vapor, in the form of steam. When in the last condition, the gaseous, it is invisible. That to which the term steam is very commonly applied, is not steam, but water in a state of fine division, or mist.

Below 32° F., pure water exists in the form of ice. Between 32° and 212°, it is a liquid. At 212° it is converted into vapor. Water slowly evaporates at all temperatures below 212°, being absorbed and held in solution by the air.

Water possesses the greatest specific heat of any substance. By specific heat is meant the actual amount of heat required to elevate its temperature a given number of degrees. For example, it requires ten times as much heat to raise a pound of water 1° in temperature as to elevate a pound of copper 1° in temperature. To raise the temperature of a pound of lead 1°, requires only one-thirtieth as much heat as to produce the same effect upon a pound of water. Water absorbs more heat by elevation of temperature than any other substance. In passing from the solid to the liquid state, it absorbs a vast amount of heat without any elevation of temperature. The same thing occurs in the conversion of water into steam or vapor by evaporation. In the evaporation of one pound of water, as much heat is absorbed, or rendered latent, as would suffice to raise nearly a thousand pounds of water one degree in temperature. This heat is abstracted from sur-

rounding objects; and, hence, evaporation is one of the most powerful means of producing cold. The effect is the same, no matter what the temperature at which evaporation occurs.

Water is not the best conductor of heat, but it conducts much more readily than air, and readily communicates its heat to bodies with which it comes in contact, also abstracting heat when of a lower temperature, when changing from a solid to a liquid state, or from the liquid to the gaseous condition.

One of the most useful properties of water is its power to dissolve numerous substances, its solvent properties being nearly universal. To this property it owes its value as a cleansing agent, as also its value as a means of aiding nutrition by dissolving and circulating the nutritive elements required for the sustenance of the body, and washing away from the tissues the waste products resulting from their activity. It is also through its solvent properties, as we shall show, that some of its most important remedial applications are attributable.

The Physiological Effects of Water.—The effects of water upon the human system are the results of the operation of its physical properties in conjunction with the vital forces. As with all other agents, its effects may be either local or general, according to the mode of application. Different effects are also produced, according as the administration is internal or external. Many other modifying circumstances, as age, sex, and physical condition, affect the results in a greater or less degree.

Water affects the system through three different means; viz:—

1. As a diluent.
2. By its solvent properties.
3. By modifying the general or local temperature of the body.

1. Water as a Diluent.—Water is received into the system by absorption, either through a mucous membrane, or through the skin. It usually enters through the medium of the stomach and intestinal canal. When received into the blood, it of course increases its volume, and produces an increased fullness of the circulatory vessels, which are never distended to their fullest extent, and hence allow room for change in the volume of their contents. The blood is necessarily rendered more fluid, and if previously in any degree viscid its circulation is quickened by its dilution. Hence it is of great importance that care should be taken to supply the blood with a sufficient quantity of fluid. This is especially necessary during the hot season of the year, when

the blood loses its watery portion quite rapidly through profuse perspiration. It is also important to be remembered by those who are exposed to extreme artificial heat, as is the case with glass-blowers, furnace-men, stokers, etc.

2. The Effects of the Solvent Properties of Water.— With the exception of air, water is the most transient of all the elements received into the body. It is eliminated by the skin, the lungs, the kidneys, and the intestines. By its solvent action, it dissolves the various poisonous products of the disintegration of the tissues. The volume of the blood being increased, more water comes in contact with the debris contained in any part, and, in consequence, the same undesirable products are more perfectly removed. The increased amount of excrementitious matter in solution is brought in contact with the various depurating organs, producing, notably, the following results:—

a. An increase of the urinary excretion. It is an important fact that this increase does not consist in the addition of water merely, or dilution, but that there is also an increased amount of *urea,* the chief excrementitious principle removed from the blood by the kidneys.

b. An increase in the cutaneous excretion. Water-drinking is one of the most efficient means of producing copious perspiration; which, as with the urinary excretion, is not a mere elimination of water, but is a real depurating process.

c. An increase in the action of the liver. Experiments made with every care to avoid the possibility of error, by the most eminent scientists and physiologists, show that the drinking of water is one of the most efficient means of increasing the activity of the liver, increasing not only the quantity of bile formed, but the amount of solid matter secreted and excreted.

d. Increased action of the intestinal mucous membrane. Elimination from the mucous membrane of the intestinal canal, which is an important organ of excretion, is also increased by drinking freely of pure water. The result of this increased action is not only to remove from the blood some of its foulest constituents, but to render more fluid the contents of the intestines, and thus tend to obviate that almost universal accompaniment of sedentary habits, constipation.

The removal of clogging matters from the system in this manner allows greater freedom of vital action, so that the activities of the body are quickened, and both waste and repair, disintegration and assimilation, are accelerated.

The use of water thus hastens all the vital processes by increasing the change of tissue. This result is, of course, chiefly obtained by employing it as a drink. The experiments of Liebig fully confirm this view. He expressly mentions the free use of water as one of the means of accelerating vital change. Prof. John B. Biddle, M. D., in his "Materia Medica," states that "it promotes both the metamorphosis and construction of tissue," from which fact he attributes to it valuable curative properties as an alterative, when the removal of a morbid taint is desired, as in certain venereal diseases. Numerous other observers and experimenters attribute to water the same effects. It has also been noted that not only eliminative but assimilative processes are facilitated by the free use of water internally, and even in greater degree, so that those who drink water freely as a therapeutic means, usually increase in weight. The greater purity of the blood and the more perfect removal of obstructions, facilitates tissue formation and repair.

3. Effects Resulting from the Modification of Temperature.—Perhaps the most important, certainly the most common, effects of water upon the living organism are those which result from its modifications of the temperature of the body in its various modes of application. These effects vary greatly, according to the temperature and the duration of the application. General and local applications also differ in their results. All of the effects of water are chiefly the results of the vital resistance of the system in its attempts to remove abnormal or unusual conditions, or to accommodate itself to new circumstances.

Baths are divided into six classes, according to their temperature, as follows:—

1. Cold,	33° to 60° F.
2. Cool,	60° " 70° "
3. Temperate,	70° " 85° "
4. Tepid,	85° " 92° "
5. Warm,	92° " 98° "
6. Hot,	98° " 112° "

For the sake of simplicity, we will consider the effects of water applications under three heads, viz., cold, warm, and hot.

The Cold Bath.—Under this head we will consider applications of all temperatures below 85° F. Cold or cool water, applied to any portion of the body, causes instant contraction of the small arteries of the part, through its influence upon the sympathetic or vaso-motor system of nerves. So long as the application of the unusual temperature is con-

tinued, the vascular contraction is maintained, and the part seems nearly bloodless. If the cold is below 33° F., and is long continued, destruction of the tissues by freezing will result.

If a moderately cool or cold temperature is maintained for some time, the blood-vessels of the part are more or less permanently contracted, and the blood supply thus lessened. If, on the other hand, the application is very brief, the contraction of the vessels is only momentary, and is followed by a proportionate degree of relaxation, and a corresponding increase in the supply of blood to the part.

A very cold bath applied to any considerable portion of the body, and continued more than a very brief time, produces headache, dullness, sometimes nausea and vomiting, loss of sensibility, and other unpleasant and painful symptoms.

It is thus seen that the effects of cold are quite different—exactly opposite, in fact—as the application is a prolonged or a brief one. The long application produces effects in some degree permanently sedative, while the brief application is followed by a momentary condition which may be termed shock, and which is usually followed very quickly by a reaction analogous to stimulation when produced in any other manner.

Effect of Cold upon the Pulse.—The experiments of Drs. Currie, Bell, and others, show conclusively that the cold bath has the uniform effect of diminishing the frequency of the heart's action from ten to twenty beats in a minute below the usual standard. Upon the first application of cold, there is a slight increase in the rate of pulsation; but this soon subsides, and is succeeded by a marked diminution. The ultimate effect is the same, whether the application is made at its maximum degree of severity or not; but if the application is first warm, being gradually reduced in temperature, the result is reached without the occurrence of the unpleasant shock, or feeling of chilliness, which attends the sudden application of cold, especially in persons of delicate nervous sensibilities. The amount and after-duration of the diminished rate of pulsation depends upon the temperature and duration of the bath. In health, it does not commonly extend beyond a few hours at most.

Effect of Cold upon Temperature.—It was also shown by the same experimenters that the temperature of the body is reduced proportionately with the action of the heart. The natural temperature, as shown by a thermometer placed in the axilla, is 98° F. During and after a cold bath, the thermometer applied to the same part, indicates from one-half a degree to five or six, or even more degrees, diminution of temperature. In some cases the temperature continues to fall after

the bath. The real temperature is lessened, even though the skin may glow, and even seem to possess increased warmth. Cold and heat are, within certain limits, wholly relative terms to the nerves of sensibility. What is warm at one time may be cold at another, though the temperature remains the same. The same temperature may be warm to one hand and cool to the other. Temperature can only be *accurately* determined by the thermometer.

Rationale of Effects of the Cold Bath.—The manner in which the cold bath produces the sedative effects noted, is apparently simple. When applied locally, to a single organ or part, it diminishes the circulation in the part by occasioning contraction of the muscular coats of the *arterioles,* or small arteries. Their caliber being thus lessened, they of course allow the passage of less blood, and the circulation in the part is diminished. There are three causes for the decrease of heat; viz.,—

1. A portion of the heat of any part is brought to it by the blood; the supply of blood being lessened, the heat is diminished.

2. Heat is produced by vital changes which occur in the capillaries or their immediate vicinity. These depend chiefly upon the supply of oxygen, which, again, is largely regulated by the blood supply; and it being lessened with the blood, the amount of heat *produced* is diminished.

Again, it has long been known that all the vital activities of the body, which result in its growth, repair, and development, as well as all the functions peculiar to animal life, including animal heat, are due to the action of the protoplasmic elements of the body. It has also been long known that cold will restrain these activities. Every microscopist is familiar with the fact that in studying the movements of white blood corpuscles, or of other protoplasmic elements, it is necessary to maintain a temperature at least equal to that of the body. When the temperature falls, the amœboid movements cease; as the temperature is raised, they begin again. If the temperature is raised above that of the body, there is a wonderful and unnatural increase in the activity of the protoplasmic masses. In view of these well-known facts, are we not justified in the conclusion that the application of cold to the body, either locally or generally, may lessen the production of heat by lessening the vital activities, or protoplasmic movements by which animal heat is largely, if not wholly, maintained? It may be suggested in answer to this argument, that animal heat may be pro-

duced by chemical changes within the body analogous to combustion. To this we may rejoin that while the renowned Dr. Priestly, originally, and afterward Dr. Currie, and still later, the great chemist of Germany, Prof. Liebig, attributed the production of animal heat to the union of oxygen with hydrogen and carbon within the body, by a process of real combustion, later investigators have unanimously discarded the idea as unsupported by facts. The present view on this subject is that oxygen does not combine directly with the carbon, hydrogen, or any other of the elements of the tissues or of the blood, but that it is assimilated like other forms of food, while carbon di-oxide is excreted, like urea, cholesterine, and others of the effete matters of the body. Animal heat is one of the results of the various metamorphoses of the tissues by which these waste matters are produced.

3. The water in contact with the part, being of a lower temperature, abstracts heat from it as it would from any other body of a higher temperature than itself.

When the application of cold water is more general, being made to the whole body or to a considerable portion of it, the same effects are produced on a larger scale. A large proportion of the small arteries of the body, being brought under the influence of cold, are made to contract, thus directly lessening the circulation, and so diminishing, also, the production of heat. Through the sympathetic system, the same effect produced upon the small arteries is produced also upon the heart, lessening the rapidity of its contractions. Again, it has been satisfactorily shown that the action of the heart is largely controlled by the action of the small arteries; so that we have abundant explanation of the decrease in the rate of pulsation. Finally we have a cold fluid in contact with a large portion of the body, abstracting heat by conduction, as well as lessening its production.

The rationale of the effects of a cold bath of very short duration is equally simple. The sudden impression of cold excites to vigorous action the nerve centers which have control of the circulatory and heat-producing functions, and thus, through the vital reaction of the system, effects contrary to those of a prolonged application are obtained.

Thus we see that water may be applied in such a manner as to produce either most powerful stimulating effects, or to depress the vital activities of the body, diminishing circulation and animal heat in a most remarkable manner.

The effects of local applications of cold water are less marked upon the general system, though essentially the same effects are observed in the stimulation of the circulation and vital activities by short and the opposite by prolonged applications. The pulse and general temperature of the body are affected in proportion to the extent of the application.

The Hot Bath.—We shall include under this head applications of a temperature above 98° F., the mean temperature of the body. As with the cold bath, the effects differ greatly, according as the application is brief or prolonged. Local and general applications also differ in their effects.

A brief local application causes an increase in the circulation of a part which very closely resembles, perhaps is identical with, active congestion. The small arteries are distended, and the vital activities and heat of the part are increased. The several effects seem to be little different from those resulting from the application of a mild sinapism. The action of the vital instincts is defensive in both cases.

When applied to special organs, special effects are produced. For instance, a hot fomentation applied to the head for a few minutes will usually produce drowsiness by diversion of a portion of the blood supply of the brain to the skull and scalp. Prolonged applications produce a more or less permanent relaxation of the blood-vessels, and consequent congestion.

A hot bath applied to the whole body, or a large portion of it, produces an acceleration of the pulse and an increase of animal heat proportionate to the temperature of the bath. A bath at 106° to 108° F. will increase the pulse from the normal standard to one hundred or one hundred and twenty beats in a minute, in a short time. A bath four or five degrees hotter has been known to increase the pulse to more than one hundred and fifty beats in a minute.

When a hot bath is prolonged, the face becomes flushed, and the whole skin very red; the head aches; sight is sometimes dimmed; ringing in the ears, faintness, a stinging pain in the skin, and intense desire to urinate, are symptoms which are often present. Copious perspiration and intense congestion of the skin are constant effects. The cutaneous congestion, from relaxation of the blood-vessels, is apt to continue to exist after the bath, if it is greatly prolonged, to the serious injury of the subject.

The effects of the vapor bath are essentially the same as those de-

scribed, though a somewhat higher degree of heat is tolerated without injury. In the hot-air bath a still higher heat is borne with impunity.

When local applications are made at a temperature of 108° to 120° F., the first effect seems to be contraction of the small vessels. At any rate, such an application is the best known means of checking capillary hemorrhage.

Rationale of Effects of the Hot Bath.—It scarcely need be repeated that all of the effects noticed, as well as those of all other baths, are chiefly the results of modifications of vital action occasioned by the agent employed. The application of heat to the body occasions relaxation of the muscular coats of the small arteries, and increased action of those vessels. No doubt this is for the purpose of bringing moisture to the surface to protect the tissues against the unnatural heat. As is the case with cold baths, the causes which modify the heat are three; viz.,—

1. The increased quantity of blood circulating through the part brings to it an increased amount of heat.

2. Increased vital and chemical action increases the production of heat.

3. The body absorbs heat from the surrounding medium as any other colder object would do.

In the general application of hot water or vapor, effects similar to its local effects are produced upon the whole surface of the body, involving, also, to a considerable extent, the deeper structures. The pulse is accelerated because the small arteries are distended and more active, creating a demand for a greater quantity of blood, requiring an increase in the heart's action. It is also quite probable that the action of the heart is somewhat quickened as the result of the influence of heat upon the pneumogastric nerve which controls it.

The cerebral symptoms, faintness, etc., which occur when heat is applied in excess, are the result of the diversion of so large a proportion of the blood into the superficial vessels. A prolonged hot foot bath or leg bath will often produce faintness.

There are few agents which will so rapidly produce such powerfully excitant and stimulant effects as the hot bath. The painful and undesirable results occasioned by its incautious use are evidences of its power.

The Warm Bath.—In this connection we apply the term warm to

baths of a temperature between 85° and 98° F., though baths of a temperature between 85° and 92° would be more accurately termed tepid, which term is applied to baths of that temperature elsewhere than in this immediate connection.

The warm bath never exceeds the temperature of the body, and is usually below it. Its effect is uniformly to diminish the frequency of the pulse and of respiration, and to decrease animal heat. Its effects are the same, though less in degree, as those of the cool or cold bath, in this respect, but they differ in several other particulars. Unlike the cold bath, the warm bath is not accompanied by an unpleasant shock or chill, and hence is not followed by reaction. It promotes the action of the skin in a very marked degree, increasing both perspiration and absorption. When continued for an hour or two, the weight is appreciably increased by the absorption of water. Its general effects are very mild and soothing, often inclining the patient to sleep.

This bath seems to produce its effects not so much by exciting the vital energies to abnormal action or resistance as by supplying the most favorable conditions for the performance of the natural and usual functions. This is doubtless on account of its close approximation to the temperature of the body. In this respect, if this supposition be true, it differs from baths of a temperature either much above or greatly below the normal temperature of the body.

Hebra, the eminent dematologist of Vienna, has shown by actual tests that human beings may exist in the warm bath not only many hours, but days, weeks, and even months—in one case nine months—without suffering the slightest inconvenience, all the bodily functions being performed without the least departure from the normal standard.

The warm vapor bath produces effects quite analogous to those of the warm water bath. Its effect upon the processes of perspiration and absorption is a little more marked, even with the same degree of temperature. The results differ somewhat, according as the whole body is enveloped, so that the warm vapor is taken into the lungs, or the head excluded. A more equable effect is produced by including the whole body in the bath, and no harm can result if the temperature is not raised above that of the body, as it should not be, in the *warm* bath.

Sympathetic Effects.—There is scarcely room for doubt that many of the effects of the various kinds of water applications are wholly of a sympathetic character. All portions of the body are intimately associated together by a system of nerves called the sympathetic system, from their peculiar function. Certain portions, as the skin and mucous membrane, are particularly related. The large number of sensitive nerves which connect the skin with the brain, bring it in peculiarly close relations to that organ, and give additional potency to any agent applied to so extensive a surface. The well-known fact that burns of the skin are often the occasion of fatal ulceration of the mucous membrane of the intestines sufficiently attests the intimate relation between these two tissues; while the effects upon the skin of mental emotions, as of shame and of fear, are conclusive evidence of the peculiar closeness of relation between the cerebral and cutaneous organs. Another fact observed by physiologists clearly shows the sympathetic effects of water under some circumstances, at least. It has been noticed that if one foot be placed in cold water, the other foot becomes warmer, an effect undoubtedly due to the sympathy existing between the two organs, both being alike affected by the effort of the system to maintain the normal temperature of the exposed organ.

Dr. Chapman, of London, a few years ago called the attention of the profession to the fact which he claims to have demonstrated that the application of heat or cold to the spine produces opposite effects in the parts to which they are applied and the parts of the body to which the nerves originating in those parts are distributed. That is, cold to the spine causes an increase in the blood supply of remote parts, while heat produces opposite effects. This he explains by the supposition that cold paralyzes the vasomotor centers and that heat stimulates their action. We have verified many of his results in our own practice, and believe the effects to be such as he claims.

Modes of Administration.—There are numerous modes of administering baths of all temperatures, each of which produces some modification of the general effect of the given temperature. For example, such baths as the douche, the spray, and the shower bath, are much more cooling in their effects than a full bath at the same temperature; since, in the latter case, nearly the whole body would be submerged in a medium of equable temperature, while in the case of the spray, etc., the body would be additionally cooled by the rapid

evaporation taking place upon its surface. Packings of all sorts produce powerful diaphoresis, or perspiration. Alternate hot and cold applications occasion strong stimulant or revulsive effects. Many other peculiar effects are obtained by particular modes of administration, which will be described in their proper place.

REMEDIAL PROPERTIES OF WATER, OR HYDRO-THERAPEUTICS.

Under this head we shall consider briefly the different remedial purposes to which water may be applied, endeavoring to explain its various medical uses by its physiological effects, which we have already studied.

The value of most remedies is usually estimated by the number of "properties" which they possess and the efficiency and certainty with which their various effects may be obtained. Considered in this light, water may be presented as one of the most useful of all known remedies. Indeed, when the great diversity of its uses and the prompt and efficient character of its effects, together with the kindly manner in which it is received by the system, are considered, it is not to be wondered at that it has found not a few enthusiastic advocates who have believed it to be a universal remedy, a panacea for all human ills. Those who are best acquainted with its properties and its potency when properly applied are the most enthusiastic in its praise. The eminent Dr. Fothergill, of England, well known in this country through his admirable papers in American medical journals, would seem to be almost as warm an advocate of its use as the most ardent disciple of Priessnitz. In his "Hand-Book of Treatment" he says, "Personally I believe that hydropathy, rescued from quackery and under proper professional guidance and superintendence, will form one of the most universal remedies of the future." The same author again remarks in the work referred to, "Indeed, in hydropathy we see empirically achieved what a scientific physiology would ere long have indicated as the logical and rational plan of treatment of numerous affections of mature and advanced life, which take their origin in the imperfect elimination of waste, either the products of tissue change, histolysis, or the results of protein compounds imperfectly assimilated or furnished to the system in excess of its needs."

Percy, an eminent foreign physician, surgeon-in-chief of the armies

of the Moselle and the Rhine, declared that he would abandon the practice of medicine if water were denied him as a remedial agent, saying, "Water furnishes immense resources as a curative agent."

The remedial or therapeutic properties of water at various temperatures and applied in various forms may be stated to be the following:—

Refrigerant or *antiphlogistic, tonic, sedative, antispasmodic, anodyne, anesthetic, styptic, dissolvent, eliminative, laxative, emetic, derivative,* and *alterative.* Others might be added, but these are sufficient to represent its several uses.

Water as a Refrigerant.—Refrigerant, antiphlogistic, or antipyretic remedies are such as have the effect to diminish bodily heat and restrain inflammation. These remedies are very useful, indeed indispensable, in the rational treatment of fevers and local inflammations, as well as in the prevention of inflammation from contusions, lacerations, fractures, and other surgical injuries. When early applied at a low temperature, water greatly lessens the production of heat, and also aids elimination by conduction. For this purpose it is unrivaled in the whole range of remedial agents. No other remedy will so readily, so easily, and so certainly bring down the temperature of a fever, diminish the pulse, and ameliorate all the symptoms depending on exaggeration of vital activity as this. How this is effected has been previously explained in considering the physiological effects of water.

Water as a Tonic.—Water may be used in such a way as to increase the rapidity of the circulation and the temperature very quickly and powerfully. The hot bath is a most efficient stimulant, in the true sense of the word. It will so excite the circulation as to increase the pulse from seventy to one hundred and fifty in fifteen minutes. The tonic effects of a short cool bath are well appreciated by all who have ever enjoyed it.

Sedative Effects of Water.—Remedies which depress vital action are termed sedatives. Cold water is one of the most effective sedatives. It will lower the temperature, rapidly diminish the pulse, and restrain excessive vital action to almost any degree desired, and without any of the unpleasant after-effects and few of the immediate dangers which accompany the use of such remedies as prussic acid, tobacco, and blood-letting. The cool or tepid bath will often reduce the pulse twenty to forty beats per minute in a short time.

Antispasmodic.—No remedy is so certainly successful in hysterical convulsions as water. In infantile convulsions, its success is also unri-

valed. In cramp, tetanus, and various forms of spasmodic affections, and even in puerperal convulsions, its utility has been well demonstrated.

Water as an Anodyne.—The effects of local applications of both warm and cold water in relieving pain are well known. In many other modes of application it is also effective in a very high degree in relieving pain and nervous irritability.

Water as an Anesthetic.—The anesthetic effects of water at a very low temperature or in the form of ice are too well known to need more than mention.

Styptic Effects of Water.—The efficiency of cold water as a ready means for arresting hemorrhage has long been recognized in surgery; within a few years, however, it has been discovered that hot water, when properly applied, has a still more powerful effect, especially in cases of capillary oozing or bleeding from small vessels. We have on several occasions checked almost instantly a bleeding which resisted all other means which could be applied.

Water as a Dissolvent.—The power of water to secure the absorption or dispersion of some forms of morbid growths, particularly glandular enlargements, is now well recognized. By cold, or alternate hot and cold, applications, chronic swellings of the joints and other parts, serous accumulations, enlargements of lymphatic glands, of the thyroid gland, and even of the spleen and liver, may be successfully treated.

Eliminative Effects of Water.—As water is a perfect solvent for the various excrementitious substances produced in the body through tissue waste, as well as of all the foreign elements which find entrance to the blood, it is of all substances the most efficient and powerful eliminative. It has been proven to be thus eminently useful as a *diaphoretic,* in increasing the action of the skin; as a *diuretic,* in facilitating excretion by the kidneys; and as a most excellent *cholagogue,* in increasing the activity of the liver and occasioning a consequent increase in the production of bile. It is also, when properly applied, an excellent *expectorant,* and undoubtedly also increases the action of all the excretory organs of the body.

Laxative.—Used in various ways, water is very effectual in producing movement of the bowels, but never occasions those violent and unpleasant symptoms which accompany and succeed the use of purgatives.

Emetic.—In the great majority of cases no other emetic is needed, and no better can be found. Nearly all emetics require water to render them efficient.

Alterative.—For a long period, mercury has been considered as the champion alterative of the materia medica. It must yield the place to water, however; for the most it can do is to destroy the elements of the blood, while water not only accelerates waste, but increases construction in the same proportion, according to the experiments of Prof. Liebig and other eminent observers. This effect of water results from both its internal and its external use.

Derivative.—One of the most important properties of water applications is their powerful derivative effect. No other application, internal or external, can equal them in efficiency and certainty of action.

There are very few agents which possess so many remedial properties as water. There are none which effect so much with so little expense to the vital powers of the patient. Many drugs will produce results similar to those obtained by the use of water, and thus accomplish good, no doubt; but at the same time they often work so much mischief in the system that the evil done is frequently much greater than the good accomplished. The aim of the faithful physician should be to accomplish for his patient the greatest amount of good at the least expense of vitality; and it is an indisputable fact that in a large number of cases water is just the agent with which this desirable end can be obtained.

HISTORY OF HYDRO-THERAPEUTICS.

The utility of water as an agent in the treatment of disease is not a modern discovery, as the pretensions of some aspirants for notoriety have led many to believe. A very cursory glance at the history of various ancient nations furnishes sufficient evidence that the use of the bath as a curative agent was of very remote origin. The works of the oldest medical authors contain numerous references to the bath, recommendations of its use in cases of disease, and testimonials of its good effects when properly employed. As this is a matter of some interest to many of those who employ and advocate the use of water as a remedial agent, as well as to those who are investigating its merits, we shall devote a little space to a sketch of the use and estimation of the bath by various nations and tribes—civilized and barbarous—and regular and irregular physicians, from the remote ages of antiquity down to modern times.

The Bath in Egypt.—That bathing was practiced to a considerable extent by the Egyptians at a very early period, is evinced by both sacred and profane history. It was through obedience to this custom that

Moses was discovered among the rushes by Pharaoh's daughter as she went down to the river-side to bathe. Pictures discovered in ancient Egyptian tombs represent persons preparing for the bath. We have no expression of the estimate which was placed upon the bath as a remedial agent; but it is hardly possible to believe that an agent held in such high esteem as a preventive of disease should not be valued as a useful remedy.

Bathing among the Jews.—The code of laws prepared by Moses, under divine instruction, for the government of the Hebrew nation after its departure from Egypt, made bathing a prominent feature. The connection of the bath with the treatment of leprosy would naturally lead to the conclusion that it was employed for its curative effects.

Persian Baths.—The ancient Persians held the bath in such high esteem that they erected magnificent public structures devoted to bathing. The baths of Darius are spoken of as especially remarkable. According to the statements of a German physician, the Persians still continue the use of water as a remedial agent, especially in cholera times, when pails of water are in some cities placed at the street corners and along the road to be in readiness for use as soon as an individual is attacked. The mode of treatment is the cold douche, followed by vigorous friction of the skin.

The Bath among the Greeks.—The cold bath was employed among the Greeks. Lycurgus, the famous Spartan legislator, prescribed its daily use by all his subjects, not excepting the tenderest infants. In later times, the warm bath was introduced, and stately buildings were erected for the accommodation of bathers.

The learned Greek, Hippocrates, the father of medical literature, and a very acute observer of disease and the effects of various agents upon the body, highly recommended the use of water in many diseases, describing with great care the proper mode of administering a simple bath. He laid great stress upon the careful and skillful use of the bath, asserting that, when improperly applied, it, "instead of doing good, may rather prove injurious." His directions for the employment of the bath were very discreet. He very wisely remarks that those patients whose symptoms are such that they would be benefited by bathing should be bathed, even though some of the requisite conveniences may be wanting; while those whose symptoms do not indicate the need of this remedy, should not employ it, though all the neces-

sary appliances are at hand. He made great use of water as a beverage in treating disease.

Roman Baths.—The Romans excelled all other nations in the sumptuousness of their bathing arrangements. Their public baths were among their greatest works of architecture, and were supplied with every convenience for increasing the utility and luxury of the bath. Kings and emperors vied with each other in perfecting and enlarging these sanitary institutions. Accommodations were provided, in some cases, for nearly 20,000 persons to bathe simultaneously; and at one time the number of public baths in Rome was nearly one thousand. Even Nero, whose name has come down to us covered with infamy, has the credit of doing at least one good act in erecting a magnificent public bath, though even the detergent effects of such an act can hardly cleanse his character of the many foul blots by which it is rendered odious.

Celsus and Galen, two noted Latin physicians, extolled the bath as an invaluable remedy almost two thousand years ago. The latter pronounced the bath to be one of the essential features of a system of perfect cure which he termed *apotheraphia,* exercise and friction being the other essentials. If the regular physicians of half a century ago had followed the practice of Galen, as described in his works, they would have refreshed their languishing fever patients with cold water as a beverage instead of leaving them to be consumed by the pent-up fires which parched their lips, disorganized their blood, and finally ended their sufferings with their lives. Celsus was proud to boast of employing the bath more frequently and systematically than others had done before his time.

The emperor Augustus was cured by the bath, of a disease which had baffled all other remedies.

Testimony of Arabian Physicians.—Although the Arabians are at the present day looked upon, and justly, as a horde of wandering wild-men, a thousand years ago their physicians were among the most learned of the age; and they were as sensible as learned, we judge, for they were most enthusiastic advocates of the efficiency of the bath. Rhazes, one of the most eminent of them, describes a plan of treating small-pox and measles which would scarcely be modified by the most zealous advocate of water treatment at the present day. Avicenna and Meshnes, with others, may be mentioned as holding similar views.

The bath was much used in pestilences by this nation, and was largely employed in Constantinople in the fifteenth century.

Modern Bathing Customs.—Three centuries ago, public vapor baths were very numerous in Paris, being connected with barber shops, as are many baths in this country at the present time. According to Dr. Bell, Paris can still boast of a great number of bathing establishments. He states that in the baths connected with the city hospitals nearly 130,000 baths were administered in a single year to out-door patients. Doubtless those treated in the hospitals were duly washed and steamed as well. This is certainly a very marked contrast with what we see in the hospitals in this country at the present day. Notwithstanding the advances in many other particulars of hospital management, the cuticles of patients are sadly neglected. In some of our largest hospitals, the filthiness of many patients is so great that close proximity to them is absolutely intolerable. Half a dozen of them, placed in a warm room, speedily impart to the air a fetor unequaled by anything but the effluvia arising from a neglected pig-sty. Such neglect is inexcusable.

The Germans of olden time were very fond of bathing, according to their historical records, and during the Middle Ages, when plagued with the leprosy, the national faith in the virtues of the bath was manifested by making it a religious duty. It is related of Charlemagne that he used to hold his court in a huge warm bath. Modern Teutons seem less partial to the bath, having transferred their fondness from *aqua pura* to lager-beer.

Although the bath was very freely used in England while the island was occupied by the Romans, who erected commodious baths like those in Rome, the wholesome practice is now sadly neglected by the English people, if we may credit their own writers.

It is a curious fact that the bath seems to be quite generally neglected by the most civilized races, while it is almost universally employed by those less advanced nations, the Russians, Turks, Finlanders, and the inhabitants of Persia, Egypt, Barbary, and Hindostan. The Finlanders make great use of the sweating bath. To nearly every house is attached a small sweat-house, where they subject themselves to a temperature of more than 160° F., often emerging at once into an atmosphere much below freezing, with apparent impunity. The Turkish and Russian baths, similar to which are those in use in Egypt and India, are elsewhere described.

The North American Indians employ the bath for many diseases. They have original and peculiar ways of administering both water and vapor baths. The most common bath among them is the vapor, followed by a plunge into a neighboring stream. They generate the steam by pouring water upon hot stones while they are inclosed in a small, close hut, made of mud or skins. The native Mexicans secure a hot-air bath by confining themselves in a brick sweat-house which is heated by a furnace outside. These savages seem to have the most implicit confidence in the efficacy of the bath, always employing it when ill, and with excellent success. The Africans, also, are not unacquainted with the medical uses of the bath. It is stated that on the outbreak of small-pox on a slave-ship many years ago the negroes begged so piteously, when treated in the usual manner, by smothering beneath many thicknesses of blankets and mattresses, to be allowed to follow their own method, that they were at last permitted to do so, when they at once tied ropes about the bodies of the patients and let them down into the sea. This was done several times a day; and all thus treated recovered.

Modern Medical Use of Water.—In the early part of the eighteenth century, a Sicilian named Fra Bernado acquired the title of "cold-water doctor" from his exclusive use of cold water in treating the sick.

At the very beginning of the eighteenth century, Floyer published a history of bathing which contains accounts of many remarkable cures effected by means of the bath, which he recommended as a most efficient cure for numerous diseases.

A Mr. Hancock, a clergyman, published in 1722 a tract entitled, "Common Water the Best Cure of Fevers." Another writer, in a work entitled "The Curiosities of Common Water," published in 1723, speaks of water as an "excellent remedy which will perform cures with very little trouble, and without any charge," and "may be truly styled, a universal remedy." Both French and German writers were zealously advocating the use of water as a remedy for many diseases at this same period. Many of the French surgeons had also discovered the immense utility of water in surgery, receiving their first lessons of instruction from an ignorant and superstitious miller, who used water in conjunction with charms.

In the latter part of the last century, Drs. Jackson and Currie each published reports of cases of fever in which they had found the use of

the bath a remedy of remarkable efficacy. Dr. Currie obtained many followers for a time, but no very deep impression was made upon the public mind, though his cases were authentic, and were very ably reported.

About the end of the first quarter of the present century, a native of Græfenberg, a small town in Austrian Silesia, by the name of Priessnitz, met with an accident by which three of his ribs were broken. He treated himself by applications of cold water, and then tried the same remedy upon others in similar cases. His success encouraged him to make further experiments, and though an ignorant peasant, his natural acuteness enabled him to devise various means for applying water to the body, and to suit the application to different diseases. His increasing success attracted numerous patients, and his fame became, in a few years, world-wide. Many of his methods were very rude, and his ignorance of medical science often led him into errors; but he succeeded in restoring to health hundreds of patients whose maladies had been pronounced incurable.

The interest in the new method became so great that numerous other individuals, equally ignorant and possessing less shrewdness, undertook to imitate the German innovator. Some of them were successful, many of them were not; all were alike in committing numerous blunders through ignorance of scientific medicine. But public attention was called to the utility of water as a remedial agent so forcibly that a powerful impression was produced in its favor. From that time until the present, the use of water has been largely in the hands of unscientific empirics who have advocated it as a specific, and employed it to the exclusion of other remedies in a large measure. This course, together with many other gross errors connected with the practice, has deterred scientific physicians from employing it sufficiently to test its merits, only in a few exceptional instances.

The friends of Priessnitz claimed for him a great discovery; but as we have seen, he discovered nothing which was not known a century before, if not, indeed, some thousands of years previous. It is doing Priessnitz no injustice to say that he did little or nothing toward establishing principles, but followed, chiefly, a routine method of practice.

Testimony of Eminent Physicians.—A few scientific members of the medical profession have investigated the subject in some degree, however, at various times, and the result has been that at the present day the utility of water is a well-recognized fact, and it is now often

prescribed in the standard text-books as an excellent remedy for many diseased conditions. Yet, that there is still a want of appreciation of the remedy is fully attested by the infrequency of its use by the regular profession. This neglect may be due in part to a prejudice which the members of the regular profession have acquired on account of the quackery which has too often been connected with the use of this remedy. Nevertheless, there is no good reason why an efficient remedial agent should be suffered to receive the stigma which properly attaches only to those who are responsible for its abuse. Within the last few years there has been a growing interest in hydrotherapy, especially among the leading physicians of France and Germany. In this country, also, an interest has been awakened in the subject, although among the non-progressive part of the medical profession there still remains much of the "old-time" prejudice, which has for years prevented this powerful remedial agent from taking its proper place in the front rank of therapeutic agents. Perhaps it may be interesting to consider the testimony of a few distinguished medical authorities in favor of water as a remedial agent.

In favor of the use of water in febrile diseases we may cite the well-known names of Brand, Hagenbach, Ziemssen, Winternitz, Immerman, Mosler, Wilson, Fox, Bartels, Liebermeister, Ludwig, Schrœder, Fiedler, Hartenstein, Weber, Greenhow, Thompson, Niemeyer, and Ringer, among foreign physicians of eminence; and a still larger list of physicians of the highest standing in this country might be added.

A few years ago we were present at a meeting of the New York Academy of Medicine, where we had the pleasure of listening to an able paper by Prof. Austin Flint, M. D., president of the Academy, entitled, "The Researches of Currie, and Recent Views concerning the Use of Cold Water." The following is a brief abstract of the paper:—

Currie employed scientific methods in observing the phenomena of disease. He was one of the first to employ the thermometer in studying disease, and his observations can be received as reliable.

The use of water externally as a means of reducing the temperature of the body in disease has recently been coming quite prominently into notice. According to Liebermeister, a noted German medical author, Currie, was the first to systematize the use of water. His work was published in 1797. Liebermeister, in his recent article on typhoid fever, accords to cold water the first place in importance as an article for reducing the temperature. The use of water for this purpose is at present

attracting much attention; and it is safe to predict that *it will soon occupy an important place as a remedial agent.*

Much harm has been done by the "rude empiricism" of Priessnitz, and the various water-cures in the country; though much good has also been accomplished by the latter institutions, and they have in a measure prepared the public mind for the general introduction of water as a remedial agent.

After the publication of the views of Currie in 1797, his method of practice, which was chiefly hydropathic, became quite general, but it was soon nearly forgotten. Trousseau recommended water treatment in scarlatina, and the use of the remedy has continued to be recommended in the text-books; but as a measure of treatment in practice it has become nearly obsolete. It is, however, obvious that unless we accept the absurd proposition that diseases have changed since Currie's time, the remedy which he recommended so highly must be just as efficient now as then.

Dr. Currie made use of the cold douche in fevers, applying it vigorously to the patient while in the height of the fever, and continuing it until the temperature became decreased, as indicated by the thermometer and the pulse. He treated seven cases of continued fever by this method at the Liverpool infirmary. All recovered. In an epidemic of typhoid fever among a regiment of troops, he treated fifty-eight cases, using the cool tepid douche in all but two cases. The latter died. The remaining fifty-six recovered, the disease being greatly shortened in more than half the cases.

Dr. Currie asserted that in small-pox, the use of the bath afforded instant relief to the patient, and caused the disease to assume a benignant form.

He found the cold bath always effectual in tetanus and convulsions, as also in hysteria.

In temporary insanity from the use of liquor, this acute observer found that the cold plunge was the most efficient remedy for the worst cases.

But Dr. Currie's practice was not confined to *cold* water. He observed that affusion with tepid water was not only a more pleasant application, but that it was even more effectual in reducing unnatural heat than cold water, as it produced no reaction, not being at all stimulating in character.

With regard to the efficacy of this agent, Dr. Currie stated that by

its use in fevers the pulse would be reduced thirty or forty beats, with a corresponding decrease of temperature and almost immediate relief of headache.

In his second volume, published some six years after the first volume, Dr. Currie declared that although his experience in the use of water, especially in fevers, had been very extensive, he had had only four fatal cases in which water was employed, and had never met with a single evidence of its being in the least degree objectionable or injurious. Neither had he found that it had been thought to be objectionable by those whom he had treated. He details a very interesting account of his treatment of scarlatina in the cases of his two sons, aged, respectively, three and five years. He gave the older, in thirty-two hours, fourteen affusions, varying from cold to tepid. Twelve were found to be sufficient for the younger one. Both became convalescent in three days.

It was established by Currie that by the use of water the course of typhoid fever may be abbreviated. This is not even claimed for the modern remedies in common use.

In referring to his own experience in the use of water, Dr. Flint remarked, "The relation of my own experience will of necessity be stated in a few words, as my employment of the remedy has heretofore been much more limited than it will be in the future, if my life is spared." He then related some very interesting cases in which he had employed water as the chief remedy, with the most excellent success. He also took occasion to recommend, as one of the best means of applying water in fevers, the wet-sheet pack as employed in the various hydropathic institutions of the country. He had used the continued cold pack in a number of the worst cases of sun-stroke in Bellevue Hospital with marked success. This remedy is still employed there in this class of cases.

In a case of obstinate remittent fever, which was not in the least benefited by the thorough use of quinia, he employed the cool pack thirty-five times in a week, continuing each application from ten to thirty minutes, and always with great relief to the patient, although he finally died. He expressed the opinion that if he had employed the pack more thoroughly, making the applications longer and more frequent, the patient might have recovered.

Currie announced a true theory when he said that *the voice of nature should not be superseded by theories.* He advocated the free use

of water as a beverage in febrile diseases as an important remedial agent. Dr. F. unhesitatingly advanced the belief that the chief benefit derived from the numerous mineral waters so largely used was only that which was due to the properties of pure water. He stated as proof, that it was not long since demonstrated by chemical analysis that the only thing peculiar about the water of a certain spring, famous for medicinal virtues, was its remarkable purity. He also suggested the introduction of distilled water for cooking and drinking purposes as a necessary sanitary measure.

Dr. F. then related a remarkable case of acute inflammation of the kidneys in which the patient exhibited the characteristic symptoms of poisoning from the retention of urea. After other remedies were tried in vain, the patient's life was saved by the simple administration of water as a beverage at short intervals. The diuretic effects of the water soon washed away the poison and gave immediate relief.

After the conclusion of the paper by Dr. Flint, the venerable Dr. Richards arose and gave his experience in the use of water. His ideas of hydropathy were obtained when he was a young man, from Dr. Currie's works. He adopted the practice of Dr. C. at that time in an epidemic of typhoid fever, and with such remarkable success as to astonish old practitioners. He stated that he had cured more than one hundred cases of obstinate constipation by simply directing the patient to drink a glass of cold water half an hour before breakfast, each morning. In one of these cases the patient had not had a natural passage from the bowels for a number of years; but he was effectually cured, by the simple remedy mentioned, in the course of a few months.

Dr. Loyle gave an interesting resumé of ten years' experience in the use of water, with uniform success, especially in convulsions and scarlatina. He had employed water alone in about one hundred cases of acute inflammation of the kidneys and dropsy after scarlatina, and with wonderful success in every case. He had found it equally successful in coma, restoring consciousness when life was apparently extinct. During the late war, he on one occasion renovated twenty ambulance loads of exhausted soldiers who had fallen on the march, by the judicious use of water. He recommended water most highly as an excellent diuretic, and a capital regulator of the bowels, far superior to "after-dinner pills." He commended it also as an efficient remedy for sun-stroke and frozen feet.

The sentiment of the audience—which was wholly composed of

medical gentlemen—was shown by the hearty applause with which the remarks of each speaker were received.

We might add much other medical testimony, but as we could give no higher authority than the distinguished Dr. Flint, who stands at the head of medical practice in America, being author of the standard American text-book on practical medicine, we will not weary the reader with further quotations. The German physicians, as well as German medical works, abound with tributes to the value of water. American medical journals are full of accounts of the beneficial results following its use in fevers and numerous other conditions.

In surgery, the employment of water is rapidly gaining entire precedence. It has replaced nearly all other kinds of dressing for wounds, and its use has saved a valuable limb to many a poor sufferer who must otherwise have submitted to amputation.

In short, wherever it is faithfully and intelligently applied, water is working wonders. Yet it is still little used in comparison with its importance. Especially is its use neglected in chronic diseases. The only reason we have been able to discover for this neglect of a remedy, the merits of which are so well demonstrated and so generally acknowledged, is that its use is more troublesome and laborious than the use of drugs. A half-dozen purgative pills are taken much more easily than an enema. The administration of a diaphoretic powder is far more convenient than a pack. A blister is easier to manage than a fomentation. But the true physician, who has at heart the real good of his patient, will not sacrifice the safety or comfort of the latter to his own personal convenience.

Errors in the Use of Water.—Much of the prejudice against the use of water in treating disease has grown out of abuses of the remedy, and the putting forward of absurd claims by ignorant persons professing to understand its use. In order to vindicate the character of this powerful curative agent, it is necessary to expose the errors and ignorance of those who have abused it.

In the early days of the modern water-cure practice, which was very largely introduced by Priessnitz, cold water was the universal remedy. No matter what the nature of the disease, or the condition or temperament of the patient, the remedy was the same. At the establishment of the Græfenberg doctor, ice-cold douches, precipitated from a height of sixteen to eighteen feet, the plunge, directly supplied by the cold mountain springs, and the shower bath of the same tem-

perature, were all administered to patients with little discrimination of modifying circumstances, in rooms unwarmed by artificial heat, even in the depths of the coldest mountain winters. As Græfenberg was the source whence most water doctors of that time drew their knowledge, the same practice was pursued elsewhere. The unreasonableness of such a course was perceived by the more judicious, and thus its influence was prejudicial.

Heroic Treatment.—Such treatment as that described in the preceding paragraph could not result otherwise than disastrously in numerous cases. The evil effects were sometimes seen at once, but more frequently they appeared after periods more or less remote. In some cases, patients were led to drink twenty or thirty glasses of cold water before breakfast, under the absurd doctrine that the evils of a small excess would be cured by greater indulgence. Hundreds of persons adopted the practice of daily bathing in ice-cold water in a cold room, even in the coldest weather. A few even went so far as to spring from their warm beds on the coldest mornings, run to a neighboring brook in a state of nudity, and plunge into its frigid waters through a hole in the ice. So infatuated were these enthusiasts that they really thought they enjoyed this refrigerating process ; but generally, a few years' continuance of it was sufficient to produce such a "sedative" effect upon their systems that some became the victims of consumption and other constitutional diseases, while others were compelled to discontinue the practice from absolute inability to continue it. A few of the more vigorous were enabled to survive this violent treatment without apparent injury for a long time ; but those of weaker vital powers soon showed the results of its evil effects.

By such processes, together with the cold sitz bath, the dry pack, and other harsh measures, the patient was sometimes brought to the very verge of the grave.

Strange as it may appear, those who were formerly the strongest opponents of the use of water, themselves afford the best instances of its excessive use. For instance, in a case of low typhus fever, a "regular" physician ordered the patient, a young woman, to be immersed in cold water for half an hour. The attendants attempted to carry out the prescription, but in a few moments her symptoms became so alarming that the patient was removed from the bath. It will not be considered remarkable that she died. A prominent New York physician, a professor of practice in one of the largest medical colleges in

America, in a report of a case of remittent fever which he had treated with water, said that he administered thirty-five cold packs in a week. The patient died; but the doctor thought that if he had been more thorough in his treatment, giving more packs and longer ones, he would have lived. Another professor, of a rival college in the same city, cited, in a public lecture, a case of pneumonia which was treated hydropathically by a regular physician of note. The patient, while very feeble, was placed in a cold bath. He was taken out shivering, and died an hour afterward. His conclusion was that water was a very hazardous remedy. We would certainly agree with the professor's conclusion if the case cited were an example of the *proper* use of water. In the preceding case, we will not say that the packs were not beneficial; but if they had been thus used by a professed hydropathist, the treatment would have been pronounced decidedly heroic.

Crises.—By the violent processes which have been mentioned, the patient was frequently brought into a condition similar to that produced by the old process of depletion by bleeding, antimony, mercury, and purgatives. Painful skin eruptions, boils, and carbuncles, often covered the whole body. Acute pains racked the body of the patient from head to foot. If he survived this "crisis," he usually got well, which was regarded as an evidence of the salutary effect of the crisis, and so it became an important object to be attained; and the worse a patient felt, the more certain and speedy, he was encouraged to believe, would be his recovery. No account was taken of the immense waste of vital energy during these painful morbid processes.

The use of the abdominal bandage, continued for a long time until an eruption is produced, is another means by which some have sought to effect a cure of their patients. This course is pursued under the belief that the discharge occurring from the surface which thus becomes diseased is a vicarious means of removing impurities from the system—an absurd notion which no one acquainted with the first principles of physiology and surgical pathology could entertain for a moment. In many instances the skin is permanently injured by this process, as is evidenced by the appearance of pigment spots.

Hydropathic Quacks.—Unfortunately for the reputation of water as a remedy, its use has been largely in the hands of empirics who have used it in a routine manner, and have supposed it to be a cure-all, and the only remedy of any value; at least, such have been the claims made for it. This has served to bring it into disrepute, the dis-

grace which ought to attach to individuals being applied by an indiscriminating public to the innocent victim of abuse.

Ignorance.—The greatest bane of all has been the ignorance of those who have professed to be qualified to administer water as a remedy understandingly. Priessnitz himself was an ignorant peasant. He was innocent of either anatomical or surgical knowledge. His slight acquaintance with physiology was gathered by cursory observations of patients. Of the effects of water he knew more, studying them with a good degree of acuteness. His lamentable want of knowledge allowed him to fall into many errors. It is related of him that he treated hopeless cases of solid anchylosis of joints just as though they were mere cases of stiffness from rheumatism. Cases of hopeless organic disease he pronounced curable and submitted to long but unavailing treatment, not knowing the real nature of the disease. A young lady died of what he supposed an internal abscess. No abscess was found, upon which he remarked that "she had too short a neck for long life." It is but fair to remark, however, that Priessnitz became more careful and discriminating in later years, and either refused cases of advanced phthisis or employed cold water in their treatment with great caution. Kneippism is a revival of these practices.

It could be no wonder that the disciples of such a master should be sadly lacking in many of those qualifications essential for a successful physician, no matter what the remedies employed. The most lamentable feature of the matter is that the same ignorance has continued to be, with few exceptions, characteristic of those who have employed water as a remedy; this has been especially disastrous because a man with the native shrewdness and acuteness of perception of Priessnitz has rarely appeared in the ranks of hydropathists.

A Popular Error.—It is a grievous popular error that any one can apply water as skillfully as the most experienced physician, and that its successful use requires no knowledge of the structure and functions of the human body. No doubt this has grown out of another error, perhaps quite as common; viz., that water is so simple a remedy that it will do no harm if it does no good. Such notions have frequently led to most disastrous results. Water, as already shown, is one of the most powerful remedies. And while it is, undoubtedly, far safer in the hands of the uneducated than blisters, purgatives, diuretics, and such agents as opium, chloral, alcohol, and most other drugs, yet it certainly requires careful usage, and the more scientific knowl-

edge the user possesses, the more skillfully will he be able to apply it. It is, furthermore, true that a great majority of ordinary diseases are commonly so void of danger under careful nursing and hygienic management that the application of water is a simple matter which any intelligent mother can perform successfully. A case is related by good authority of a person who fell in apoplexy an hour after taking an excessively hot bath. Another patient became a paralytic from the same cause. Water is a remedy which cannot be safely used by one who has not informed himself of its effects, and of the proper modes of application. It is especially important that the people should become intelligent in the use of this excellent remedy, since there is no doubt that one of the great obstacles which stands in the way of its general introduction by all intelligent physicians is the difficulty in getting people to carry out with care and accuracy the measures prescribed.

Absurd Claims.—Sensible people have been rightfully disgusted with the claims which have been made by certain pretentious persons for the use of water. One declares that the bath will dissolve out of the body mineral substances which have been taken into it. Another claims to have been able, by the application of fomentations to a rheumatic knee, to extract in regular order the ointments which had previously been successively applied. Numerous other claims equally preposterous might be related, if it were necessary. They have all tended to excite a feeling of contempt for a means of treating disease which is really worthy of the highest estimation.

Neglect of Other Remedies.—As has been previously remarked, many seem to have forgotten that water is not the only remedy for disease, and not only attempt to cure every disease by its application, but use it to the exclusion of all other remedies. In nearly all cases, sunlight, pure air, rest, exercise, proper food, and other hygienic agencies are quite as important as water. Electricity, too, is a remedy which should not be ignored; and skillful surgery is absolutely indispensable in not a small number of cases. Even drugs are sometimes useful auxiliaries, though doubtless infinitely more harm has resulted in the past from the employment of drugs in conjunction with water treatment than from their omission.

Rational Hydropathy leaves room for every other remedy of value. It does not regard water as a specific nor as a panacea, but only as one of the most valuable of numerous excellent remedies. It discards the

erroneous and harmful practices of empirics and ignorant charlatans, whether they concern water or other agents, and gives to the aqueous element only its due share of importance.

APPLICATIONS OF WATER.

The indications which are to be met in the treatment of disease are chiefly those enumerated below; and how admirably they are met by applications of water may be easily demonstrated by following the directions given.

1. Equalization of Circulation.—Disease cannot exist without some disturbance of the circulation. In perfect health each part receives its due share of blood. One of the first indications in disease, then, is to balance the circulation. If an organ contains too much blood, the application of cold water to the part will occasion contraction of the minute vessels of the part, and thus the amount of blood is lessened, as explained more at length in considering the physiological effects of water.

Or, the part may be relieved by the application of warm water in some form to adjacent or remote parts of the body, by which means the surplus blood will be drawn to other parts, thus relieving the suffering organ. Again, if an organ contains too little blood, the opposite course must be pursued. Warm or hot applications are made to the part, while cold applications may be made to other parts if necessary. Very often the two remedies may be advantageously combined, since one part cannot contain too much blood without some other part or parts being deprived of the due proportion, and vice versa: so that while a cold application is needed at one part, the opposite is required at another.

2. Regulation of Temperature.—As the condition of the bodily temperature is closely associated with that of the circulation, the two are usually controlled by the same remedies applied in the same manner. A part which contains too much blood has usually, also, too high a degree of heat. The cold application relieves both. If the entire surface of the body is involved, the application must be as extensive as necessary to affect the whole. In general fevers, the admirable adaptation of water to this end is well exhibited. When the temperature of the body rises above 100°, or even above 98°, a cooling bath should be resorted to. It may consist of a simple sponging with water, scarcely below the bodily temperature, an affusion with tepid water, a

full bath of a tepid, temperate, or cold temperature, or some other form of cooling application, according to the degree of cooling effect desired. Any temperature below 98° will be cooling. In general, it is better to employ a bath only a few degrees below the bodily temperature, as its application will not be followed by an increase of heat, called reaction, which follows a brief application of a cool bath. To obtain the proper cooling effects of a cool or cold bath, it must be continued for some time, from ten minutes to half an hour, at least. The same remark applies also to the application of cool baths for the purpose of equalizing the circulation.

3. Relief of Pain.— Pain is usually dependent upon disturbance of the circulation, being caused by the pressure of overfilled vessels upon the nerves in a confined space. Pain may be relieved by either hot or cold applications. The first object should be to remove the surplus blood, by local cold applications and remote hot ones. If this plan is not successful, relief will be obtained by a local hot application. which operates by relaxing the surrounding tissues, so that the nerve fibres are relieved from pressure, as well as by quickening the local circulation, and so relieving congestion. The latter method is usually most quickly successful; but it is not so radically curative as the former. Pain dependent on passive congestion will be best relieved by the method next described.

4. To Excite Activity.—Many organs often become torpid or inactive, as the skin and liver especially. Sometimes the blood-vessels of an organ become relaxed and inactive, passive congestion resulting. No remedy will so readily induce a return of activity to the affected parts as alternate hot and cold applications, continued for some minutes, fifteen to thirty or more. This is one of the best applications for the relief of old pains. Short applications of cold water in the form of the douche, spray, or ice-rubbing, are also an excellent means of increasing functional activity.

5. Removal of Obstructions.—A very large class of diseases are attributable to obstruction in various organs, caused by the reception of foreign matters into the system, and the accumulation of the natural waste of the tissues. The warm bath, to remove external obstructions, and the internal use of water as a solvent for internal sources of obstruction, are the remedies which will achieve success in nearly all cases. Offending substances in the stomach are readily re-

moved by the water emetic; and hardened accumulations in the large intestine are removed with equal facility by means of the enema.

6. Dilution of the Blood.—In fevers, cholera, and other diseases, the blood often becomes abnormally thickened, dark, and viscid, circulating with difficulty, and not imparting due nourishment to the tissues. Nothing but water can remedy this difficulty. It may be gotten into the blood by absorption from the skin, if the mucous membrane of the stomach will not absorb it. The enema is also useful.

7. Influence on the Nervous System.—Finally, it is often important to affect certain organs through their nervous centers. Water, properly applied, will accomplish this also. A fomentation applied to the abdomen will often remove headache, and is an excellent remedy for general nervousness, seeming to affect the whole system, just as does galvanic electricity when applied to the same locality, doubtless through the large nervous ganglia located in that region. It is well established that applications to the spine affect the nerve centers in a powerful manner, inducing various and prompt effects in remote organs. The relaxing, quieting effect of the warm full bath in cases of nervous irritability is well known.

Temperature of Baths.—The thermometer is the only accurate measure of temperature; hence the importance of its use in the administration of baths. Yet the thermometer may be abused. A given temperature may seem warm to one individual and tepid or cool to another. The same difference of sensation will occur in the same individual on different occasions. What seems cool to-day will be thought warm to-morrow. The susceptibility of the body to sensations of heat and cold largely depends upon its condition and the temperature of surrounding objects. In consequence of this physiological fact, it is improper to attempt, as some have done, to fix certain exact temperatures at which baths must be given to all persons under all conditions.

For convenience and perspicuity, the temperatures of baths have been divided into six grades, as given in the following table by Forbes; all who attempt to use the bath according to the directions should carefully learn and preserve the distinctions here made:—

1. Cold Bath,	33° to 60° F.
2. Cool,	60° " 75° "
3. Temperate,	75° " 85° "
4. Tepid,	85° " 92° "
5. Warm,	92° " 98° "
6. Hot,	98° "112° "

The vapor bath ranges from 98° to 120°; the hot-air or Turkish bath from 100° to 160°, or even higher, though not usefully so.

A bath of any temperature above the natural heat of the body, 98°, is a hot bath. At 32°, water becomes ice; a bath is very rarely given at this temperature, and then the application should be made to only a small surface. Water at 32°, and even ice and snow, may be usefully employed as topical remedies in local diseases. It will rarely be necessary to employ a full bath at a lower temperature than 65°, which will usually seem very cold to the patient. A temperature from 85° to 95° is the most generally useful for baths which involve a considerable portion of the body, though of course higher temperatures are employed in local applications.

How to Determine the Temperature of a Bath without a Thermometer.—It is often necessary to administer a bath when a thermometer cannot be obtained. In such cases it is customary to test the temperature by placing the hand in the water. This is an unreliable method, however; for the hand becomes, by usage, so obtuse to heat that water which would seem only warm to it would be painfully hot to the body of the patient. To avoid this source of error, it is only necessary to plunge the arm to the elbow into the water, by which means its real temperature will be determined. Water which causes redness of the skin is hot; when it feels simply comfortable, with no special sensation of either heat or cold, it is warm. Slightly cooler than this, it is tepid. When it causes the appearance of goose-flesh, it may for practical purposes be called cool, a still lower degree being cold.

Another Method.—The method about to be described is somewhat more accurate than the preceding, and may be found convenient for facilitating the preparation of a bath of proper quantity as well as temperature, a matter which though simple enough is often quite annoying to inexperienced persons. It is a fact of common knowledge that water boils at 212° F. Boiling water, at sea level, has this

temperature. Well and spring water, and the water of cisterns in winter, does not vary greatly from 53°. The temperature of well and spring water changes very slightly with the seasons. By combining in proper quantities water of these known temperatures, any required temperature may be produced. Not having seen this method suggested before, I have prepared the following table, which may perhaps be used to advantage in the absence of a thermometer; I advise the use of a thermometer, however, when it is possible to do so: —

Tem. 53°.				Tem. 212°.						
2	qts.	added	to	1	qt.	equals	3	qts.	at	106°
2½	"	"		1	"	"	3½	"	"	98°
3	"	"		1	"	"	4	"	"	93°
4	"	"		1	"	"	5	"	"	85°
5	"	"		1	"	"	6	"	"	80°
6	"	"		1	"	"	7	"	"	76°
8	"	"		1	"	"	9	"	"	71°

When larger quantities are needed, it is only necessary to multiply each of the combining quantities by the same number. For instance, if a gallon and a half of water is needed for a foot bath at 106°, pour into a pail or bath-tub four quarts of fresh well water and then add two quarts of boiling water. If four gallons of water are wanted for a sitz bath at 93° (a very common temperature), pour into the bath-tub three gallons of fresh well or spring water, and add one gallon of boiling water. Thus any required quantity can be obtained at the temperatures given. The cold water should be placed in the vessel first, and there should be no delay in adding the hot water, as it would rapidly lose its heat, and thus make a larger quantity necessary. Determinate measurement is not essential. The cold and hot water may be added alternately in proper proportions, being measured by the same vessel until the requisite quantity is prepared.

RULES FOR BATHING AND THE ADMINISTRATION OF BATHS.

The following general rules should be carefully studied and thoroughly understood by every one who expects to employ the bath. Much injury to health and most of the discredit cast upon the use of water as a remedy have arisen from a disregard of some of them.

1. A full bath should never be taken within two or three hours after a meal. Such local baths as fomentations, compresses, foot baths, and

even sitz baths, may be taken an hour or two after a meal; indeed, compresses and fomentations may be applied immediately after a light meal without injury.

2. Employ the thermometer to determine the temperature of every bath when possible to do so; if not, employ the other methods described.

3. The temperature of the room during a bath should be 70° to 85°. Invalids require a warmer room than persons in health. Thorough ventilation is an important matter; but drafts must be carefully prevented, by screens of netting placed before openings into the room when necessary.

4. Never apply either very cold or excessively hot treatment to aged or feeble patients. Cold is especially dangerous. Hot baths are rarely useful in health. The warm bath answers all the requirements of cleanliness.

5. Never take a cold bath when exhausted or chilly. A German emperor lost his life by taking a cool bath after a fatiguing march. Alexander came near losing his life in the same manner. Many have been rendered cripples for life by so doing. No harm will result from a cool bath if the body is simply warm, even though it may be in a state of perspiration. Contrary to the common opinion, a considerable degree of heat is the best possible preparation for a cold bath. The Finlanders rush out of their hot ovens—sweat-houses—and roll in the snow, without injury.

6. Cold baths should not be administered during the period of menstruation in females—unless there is fever with an extremely high temperature. At such times, little bathing of any kind is advisable with the exception of warm or tepid sponge baths, or such treatment as may be advised by a physician.

7. Bath attendants should carefully avoid giving "shocks" to nervous people or to those inclined to apoplexy or affected with heart disease. Shocks are unpleasant and unnecessary for any one.

8. Never apply to the head such treatment as will cause shock, as the sudden cold douche, shower, or spray bath.

9. In applying a bath to sick persons, it should always be made of a temperature agreeable to the feelings.

10. The temperature of a warm or hot bath should always be decreased just before its termination, as a precaution against taking cold.

11. Very cold and very hot baths are seldom required. The barbarous practices of half a century ago are now obsolete, or should be if

they are not quite discontinued as yet. No good resulted from them which cannot be attained by milder means, and much harm was occasioned which is avoided by the use of less extreme temperatures.

12. Those not strong and vigorous should avoid drinking freely of cold water just previous to a bath.

13. The head should always be wet before any bath; and the feet should be warmed—if not already warm—by a hot foot bath, if necessary.

14. A light hand bath every morning will be none too frequent to preserve scrupulous bodily cleanliness. More than a week should never be allowed to elapse without a bath with warm water and soap.

15. One very important element in the success of a bath is the dexterity of the attendant. The patient should be inspired with confidence both in the bath and in the skill of the attendant. The mind has much to do with the effect of a bath.

16. Patients should receive due attention during a bath, so that they may not feel that they are forgotten. Nervous patients often become very apprehensive on this account. It is also important, in most cases, that a reasonable degree of quietude should be maintained.

17. When any unusual or unexpected symptoms appear during a bath, the patient should be removed at once. In case symptoms of faintness appear, as is sometimes the case in feeble patients, during a hot bath, apply cold water to the head and face, give cool water to drink, lower the temperature of the bath by adding cool water, and place the patient as nearly as possible in a horizontal position.

18. In general baths, the patient, unless feeble, will derive benefit by assisting himself as much as possible.

19. The best time for treatment—especially cool treatment—is about three hours after breakfast.

20. In health, a cool or cold bath should be very brief, lasting not more than one or two minutes. A tepid bath should not last more than ten or fifteen minutes. A warm bath may be continued thirty or forty minutes, or even longer, but nothing could be more absurd than the custom prevailing in some places of prolonging the bath to great length. At Pfeffers and Leuk, in Switzerland, many persons spend the whole day in the water, taking their meals on floating tables, and occupying their time in reading, playing chess, and other games. Some remain in the water as many as sixteen hours out of the twenty-four. Of course, certain baths may be advantageously prolonged in cases of disease ; but

no intelligent physician will now recommend the antiquated practice which we sometimes see represented by a patient seated in a tub, with an open book in hand.

21. It is of extreme importance that the patient should be carefully dried after any bath. A large sheet is much better for this purpose than a towel. An old linen or cotton sheet is preferable to a new one, being softer.

22. A patient should never be left chilly after a bath. Rub until warm. It is equally important that the body should not be left in a state of perspiration, for it will soon become chilly.

23. Patients who are able to do so should exercise a little both before and immediately after a cool bath, to insure thorough reaction.

24. For feeble persons, an hour's rest soon after a bath will add to its beneficial effects. It is best to go to bed and cover warm.

25. If a bath is followed by headache and fever, there has been something wrong, either in the kind of bath administered, or in the manner of giving it. Headache indicates the use of either too great heat or cold, producing too violent a reaction.

26. Always employ for bathing purposes the purest water attainable. Soft water is greatly preferable to hard on many accounts.

27. Patients should not be allowed to become dependent on any special form of bath, as an after-dinner fomentation to aid digestion, the abdominal bandage, or any other appliance.

28. Order, cleanliness, dispatch, and a delicate sense of propriety, are items which every bath attendant should keep constantly in mind, and which will often contribute in no small degree to success in the use of this agent.

29. Never employ a bath without a definite and legitimate purpose in view. It is quite too customary, in many institutions where water is employed, to apply it in a routine way. Many baths are prescribed for the sake of producing variety or pleasing the patient. A faithful and scientific physician will carefully adapt his remedies to the condition of his patient, and will observe the results.

It seems to be a prevalent error that it makes little difference how water is applied, provided the patient is only wet. Warm, hot, tepid, temperate, cool, and cold baths are used indiscriminately. So, also, the different modes of administering baths of the same temperature are disregarded in many cases. In general, each particu-

lar form of bath is especially adapted to the treatment of special conditions, and it is the best test of the proficiency of a physician, in the use of water, to observe whether he recognizes the distinctions between the various kinds of baths, and is able to adapt them to the appropriate conditions.

Giving too much treatment is likely to be the error into which the inexperienced will fall, rather than the opposite extreme. Nature cannot be forced to do more than she is capable of doing; and as nature must do the healing, if a cure is accomplished, remedies should be of a helping rather than a crowding or forcing nature. The vitality of patients may be expended uselessly by treatment; for baths excite vital resistance, as well as drugs, a fact which many overlook. The dangers of over-treatment are not so great as some imagine, however, who take the opposite extreme, and advocate *rest* as the great cure-all. We have seen patients who seemed to be quite monomaniacs on the subject of "rest cure," who needed a good thorough stirring up with useful exercise more than any other kind of treatment.

GENERAL APPLICATIONS.

Baths applied to the whole surface of the body are, as we have already seen, among the most powerful means of affecting the human system either in health or disease. Baths of a temperature less than that of the body, 98°, unless of very brief application, uniformly decrease the bodily temperature. That the diminution of temperature is not merely local, being confined to the skin and superficial structures, is shown by the fact that the thermometer indicates a decline of temperature in the interior of the body as well. The cool full bath, when prolonged, diminishes the production of heat throughout the whole system, besides abstracting large quantities by its contact with the body, as previously explained. The diminution of temperature continues for hours after the bath, in cases in which it was excessively high at the time of administration. Hot baths have, in general, an opposite effect.

Swimming.—Swimming is a general bath combined with vigorous exercise, as nearly all baths should be. It is one of the most healthful kinds of exercise, if not continued too long, as it frequently is. The temperature of the water is commonly between 70° and 80° F., which makes it a temperate bath. Its effects are not far different from other forms of bath of the same temperature. We have not space to

devote to a description of the art, since there are valuable treatises on the subject.

Plunge Bath.—The hot baths of the ancient Greeks and Romans were usually followed by a plunge up to the neck in a large basin of water four or five feet deep, and large enough to allow the exercise of swimming. Many hydropathic establishments employ the same bath after packs and sweating baths. A bath of this kind is not always attainable without great expense; and it possesses no particular advantage over other methods of cooling the surface after a warm bath. It is a very severe form of bath when employed at a low temperature. In the days of Priessnitz, it was used at a temperature of 45° or 50°. More harm than good would result from a continuous employment of such treatment. The cool plunge should be of but a very few minutes' duration, and the patient should rub himself vigorously during the bath. In this, as in all other cool baths, the first contact with the water produces chilliness or shock. After two or three minutes, or less, this will be followed by a partial reaction, even while the patient is in the water, accompanied by a feeling of comfortable warmth. This will shortly be again succeeded by a second chill, which is not so likely to be followed by prompt reaction; hence, the patient should always take care to leave the bath before the occurrence of the second chill, if he would avoid unpleasant after-effects.

Sponge Bath.—The sponge or hand bath is perhaps the simplest and most useful mode of applying water to the surface of the body; for it requires the use of no appliances which every one does not possess, and it can be employed by any one without elaborate preparation, and under almost any circumstances. A great quantity of water is not required; a few quarts is a plenty, and a pint will answer admirably in an emergency. A soft sponge, or a linen or cotton cloth, and one or two soft towels, or a sheet, are the other requisites. The hand may be used in the absence of a cloth or a sponge for applying the water.

The temperature of the bath should not be above 95°, and 90° is generally better. Most people can habitually employ a temperature of 75° or 80° without injury. The use of a much lower temperature is not commonly advisable, and is often productive of great injury.

Begin the bath, as usual, by wetting the head, saturating the hair well. Wash the face, then the neck, chest, shoulders, arms, trunk, and back. Rub vigorously until the skin is red, to prevent chilling; for even when the temperature of the room is nearly equal to that of the

body, the rapid evaporation of water from the surface will lower the external temperature very rapidly unless a vigorous circulation is maintained.

After thoroughly bathing the upper portion of the body, turn the attention to the lower portion, continuing the rubbing of the upper parts at brief intervals to prevent chilliness. As soon as the bathing is concluded, envelop the body in a sheet and rub dry, or dry the skin with a towel. When the surface is nearly or quite dried, rub the whole vigorously with the bare hand.

The bath should not be prolonged more than ten or fifteen minutes. Five minutes is sufficient to secure all the benefits of the bath, and even three minutes will suffice for a very good bath.

Persons who chill easily will find it better to bathe only a portion of the body before drying it. Some will even find it necessary to retain a portion of the clothing upon the lower part of the body while bathing and drying the upper part.

Weakly patients may receive this bath with very little disturbance, even in bed. Only a small portion of the body should be uncovered at a time, being bathed, dried, rubbed, and then covered while another part is treated in a similar manner.

The sponge bath may be administered anywhere without danger of soiling the finest carpet, by using care to make the sponge or cloth nearly dry before applying it to the body. A rug may be spread upon the floor as an extra precaution. When used for cleanliness,—as it should be daily,—a little fine soap should be added two or three times a week, to remove the oleaginous secretion from the skin.

This bath is applicable whenever there is an abnormal degree of bodily heat, and in such cases may be applied every half-hour without injury, and even oftener. It is useful in cases of nervousness and sleeplessness, in chorea and laryngismus stridulus, also in that curious affection of children known as "catch in the breath." In fact, whenever water is required in any form this bath may be used with advantage, the temperature being suited to the case. Sponging with water as hot as can be borne will often relieve for several hours the profuse sweating of consumptives. Hot sponging of the face, neck, and head are useful in relieving the headache of catarrh and influenza, and in stopping nose-bleed.

Rubbing Wet-Sheet.—See Fig. 196. This bath is administered in two ways; with the sheet very wet, or dripping, and with it wrung

nearly dry. The first method is frequently called the dripping-sheet bath. In giving it, proceed as follows:—

When necessary to prevent injury to the floor or carpet, place upon the floor a large rug or oil-cloth. In the center, place a large wash-tub, in the absence of a more convenient vessel. While the patient is making himself ready for the bath, procure two large cotton sheets. Gather one end of each into folds so that it can be easily and quickly spread out; lay one upon a chair close at hand, and place the other in the tub. At a distance of three or four feet from the tub, place a low stool. Now place in the tub—if a bath at about 93° is desired, and this will be the most usual temperature—half a pailful of fresh well or spring water, and one-third as much boiling water. If a thermometer is at hand it should, of course, be used to test the temperature. After the patient has wet his head, let him step into the tub, facing the assistant, with his arms straight and pressed close to his sides. Now draw up the wet sheet by its gathered end to its full length; draw out one side quickly, place the corner over one shoulder of the patient, and while holding it in place with one hand, quickly draw the remainder of the sheet around him with the other, bringing it up well around the neck, and folding the second corner under the top so as to hold it in place. But a few seconds should be occupied in applying the sheet. Then commence rubbing the patient vigorously with both hands, one upon each side, rubbing to and fro three or four times in each place, passing over the whole body very rapidly, and then repeating the same, to prevent chilling any part. Coarse, robust, and phlegmatic people may be rubbed with a good deal of severity; but persons with delicate skin and acute sensibilities require gentler manipulation.

Fig. 196. Wet Rubbing-Sheet.

After one or two minutes of energetic rubbing, pour over the chest and shoulders a pailful of water four or five degrees cooler than that of the bath, which should be in readiness for instant use. Then rub one or two minutes longer. Now quickly disengage the wet sheet, allowing it to drop into the tub. While the patient is stepping

upon the stool, quickly grasp the dry sheet, and by the time he is in place, have him enveloped in it. Rub him dry, passing over the whole body several times in rapid succession, to prevent chilling. Care must be taken that every part is thoroughly dried. The head, armpits, groins, and feet are liable to escape attention. No moisture should be left between the toes. After wiping nearly or quite dry, apply the hand-rubbing, as elsewhere described, using care not to induce perspiration by too vigorous or long-continued rubbing. If the skin should become moist from perspiration after having been once dried, gradually lower the temperature of the room and continue light rubbing until the skin becomes dry and cool before allowing the patient to dress.

Very few baths afford a better opportunity for the display of skill and energy on the part of the attendant than this. Some practice is required to enable one to give it really well.

The other form of rubbing wet-sheet is given in about the same manner, the only difference being that the sheet is wrung before its application, and is re-applied one or more times, according as a milder or more severe form of treatment is required. The douche may be reserved until the sheet is removed the last time.

One precaution especially necessary to be observed in this bath, as well as in all others where a tepid application is succeeded by a cooler one, is frequently overlooked. *The second, cooler application should never be made until there is good reaction from the first.*

This is an excellent bath to apply after packs or warm baths which have induced perspiration, as hot-air and vapor baths. It is especially applicable to cases in which there is defective circulation in the extremities, inactive skin and liver, and nervousness. It is of special benefit in cases of debility accompanied with night sweats; and is an admirable means of removing and preventing muscular soreness and stiffness from severe exercise.

Wet-Sheet Pack.—When properly administered, this is one of the most powerful of all water appliances. Some skill is needed to apply it with a uniform degree of success. Two or three comfortables or thick blankets, one woolen blanket, and a large linen or cotton sheet, are the articles necessary. It is important to be certain that the sheet is sufficiently large to extend twice around the patient's body. More blankets are required in cool weather and by weak patients. Spread upon a bed or straight lounge the comfortables, one by one, making

them even at the top. Over them, spread the woolen blanket, allowing its upper edge to fall an inch or two below that of the last comfortable. Wet the sheet in water of the proper temperature, having gathered the end so that it can be quickly spread out. Wring so that it will not drip much, place its upper end even with the woolen blanket, and spread it out on each side of the middle sufficiently to allow the patient to lie down upon his back, which he should quickly do, letting his ears come just above the upper border of the sheet, and extending his limbs near together. The patient should then raise his arms, while the attendant draws over one side of the wet sheet, taking care to bring it in contact with as much of the body as possible, bringing it closely up beneath the arms, and pressing it down between the limbs so as to make it come in contact with both sides of them. Tuck the edge tightly under the patient on the opposite side, using care not to include the other edge of the sheet. Now let the patient clasp his hands across his chest, and then bring up the other side of the sheet. Grasp it by its upper corner with one hand, drawing it down over the shoulder and lengthwise of the body; then place the other hand upon the covered shoulder, holding the sheet firmly in place while the corner is carried upward upon the opposite side and tucked under the shoulder, thus drawing the upper edge of the sheet well up under the chin. Tuck the edge of the sheet under the body, carefully enveloping the feet. Then bring over each side of the blanket and comfortables in the manner last described, being very careful to exclude all air at the neck, and allowing the blankets to extend below the feet so that they can be folded under.

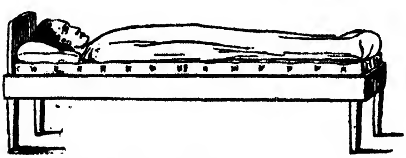


Fig. 197. Wet-Sheet Pack.

It is not desirable that the patient should be bound as tightly as a mummy. All that is necessary is the exclusion of air; and as the neck and feet are the points at which it is most likely to enter, these parts should receive particular attention, as directed. If too tightly bound, the patient will be more likely to be nervous than if allowed some freedom. The application of the wet sheet should be made in a few seconds, as it cools very rapidly when spread out. The first blanket should be brought over the patient as soon as possible. If the feet are not warm, a hot foot bath should be taken before the pack. If they

become cool in the pack, hot jugs, bricks, or stones should be applied to them. If the patient does not become comfortably warm in a few minutes,—ten or fifteen at most,—more blankets should be added, and, if necessary, dry heat should be applied to the sides. If he still remains chilly, he should be promptly removed and placed in a warm bath, or vigorously rubbed with a dry sheet and then placed in a dry pack. The head should be kept cool by frequent wetting while the patient is in the pack. If a compress is applied, it should be often renewed.

The temperature of the pack must depend upon the condition of the patient, being determined by principles elsewhere explained. A woolen sheet is better for the administration of a hot pack than one of cotton or linen. The cold pack is very rarely required. The usual temperature should be about 92°. It is proper to wet the sheet in water of about 100°, as it will be cooled several degrees while being applied.

The duration of the pack should be carefully regulated by the condition of the patient, the effects desired, and the immediate effects produced. If the patient becomes very nervous, or sweats excessively, or becomes faint, or has other seriously unpleasant or dangerous symptoms, he should be removed from the pack at once if he has not been more than ten minutes in it. Ordinarily, the pack may continue thirty to forty-five minutes. If the patient sleeps naturally, he may remain in the pack a full hour, if strong, or even longer in many cases. In fevers, short packs, frequently repeated, are more beneficial than long ones fewer in number.

The pack should be followed by the spray, the sponge bath, the douche, or the rubbing wet-sheet. It is a powerful remedy, and should not be used to excess in chronic diseases ; it has been much abused in this way. Its depurating effects are really wonderful. The increased action of the skin, together with determination of blood to that part, is so great that poisons long hidden in the system are brought out and eliminated. The odor of a sheet used in packing a gross person is often intolerable. If the patient be a tobacco-user, the sheet will be reeking with the odor of nicotine. Many times the sheet will be actually discolored with the impurities withdrawn from the body.

The applications of the pack in treating disease are very numerous. In almost all acute diseases accompanied by general febrile disturbance, and in nearly all chronic diseases, it is a most helpful remedy if rightly

managed. It is an admirable remedy for nervousness, skin diseases accompanied by thickening of the skin, as psoriasis and icthyosis, and irritations of the mucous membrane. The warm pack is an invaluable remedy in the treatment of children's diseases. It is a most successful application in convulsions.

Shower Pack.—Fig 198. In many cases of fever in which the temperature rises so high as to produce delirium, the ordinary pack does not seem to be sufficiently powerful to fully control the excessive heat. In such cases, the shower pack is found of great service. It is thus used in Bellevue Hospital, New York:

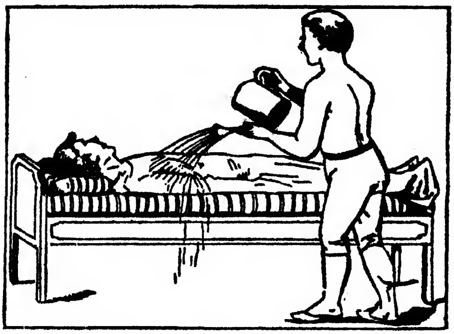


Fig. 198. The Shower Pack.

A rubber blanket is placed upon an ordinary mattress. Upon this the patient is placed, enveloped in a wet sheet as in the ordinary pack. Instead of being covered with blankets, however, he is left exposed to the air, so that the powerful cooling effects of evaporation may be obtained. As the sheet becomes warmed by the heat of the body, cool water is showered upon it from a sprinkler or watering-pot. The bath is continued thus until the temperature of the patient, as indicated by the thermometer, is sufficiently diminished.

This bath, combining as it does the cooling effects of cool water and of evaporation, is the most powerful refrigerant that can be employed; yet it is perfectly safe when judiciously used, being applied only in cases of extreme urgency on account of the high temperature.

Some practice opening the ordinary pack at intervals, and sprinkling cool water upon the patient, thus obtaining, in some degree, the prolonged cooling effect. The pack must be studied well to enable one to apply it with skill, and certainty of success.

Dry-Sheet Pack.—Though this can hardly be called a bath at its commencement, it really becomes a wet-sheet pack before its termination. Its application differs from that of the wet-sheet pack in that the patient is wrapped in woolen blankets instead of the wet sheet. The object of this treatment is to produce perspiration, which may be encouraged by

drinking either cold or hot drinks in considerable quantity, and by the application of dry artificial heat to the feet and sides. It is a very severe form of treatment, and is now seldom practiced. Many years ago, patients at hydropathic establishments were often kept for several hours in the dry pack, smothered beneath loads of comfortables, blankets, and feather-beds. If cautiously employed, it is occasionally useful in "breaking the chills" in fever and ague. For this purpose it should be administered about half an hour before the time for the beginning of the chill.

Sweating Pack.—Wrap the patient in woolen blankets. Place to his hands, sides, thighs, and feet, hot bricks, or jugs filled with hot water, wrapped with moist flannels. Beer bottles filled with hot water and covered with wet stockings are very convenient. Give frequent and copious draughts of hot water or some simple tea, as peppermint or wintergreen, or some similar drink. Keep the head cool by tepid compresses. In a few minutes most copious perspiration will be produced. After the bath, treat as after a pack. This bath is useful in all cases in which powerful action of the skin is desirable, as in chronic rheumatism, obesity, jaundice, etc. It is one of the most excellent means of curing a cold.

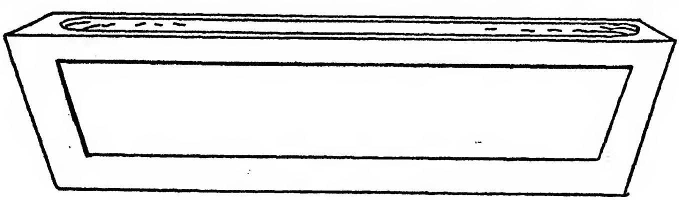


Fig. 199. The Full Bath.

Full Bath.—See Fig. 199. For this bath a tub is required the length of the body, about eighteen inches deep, two feet wide at the top, and, preferably, six inches narrower at the bottom. It is better to have the end intended for the head a little elevated. Place in the tub sufficient water so that the patient will be entirely covered, with the exception of the head, when he lies upon his back. During the bath, the body should be vigorously rubbed by the bather or an attendant, or both, particular pains being taken to knead and manipulate the abdomen, in a gentle but thorough manner. The temperature of the bath, when taken for cleanliness, or for its soothing effects, should be not higher than 95° to 98°, and it should be cooled down to about 85° or 90° before the conclusion of the bath, by the addition of cool water.

Very cold baths are used by some, especially in Germany, in the

treatment of fevers, so low a temperature as 60° being often employed. The most approved mode, however, is what is called the graduated bath, in which the temperature is gradually lowered until the desired effect has been produced.

When used to excite action of the skin, a hot bath should be employed. Begin the bath at 98° or 100° F., and gradually raise it to 108° or 110°, continuing from ten to fifteen minutes. Then remove the patient, wrap him in blankets, and let him remain sweating two or three hours.

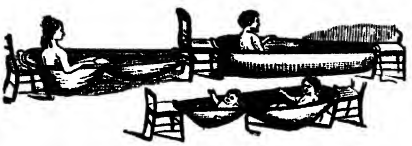


Fig. 200. Portable Rubber Bath.

Every family ought to possess conveniences for the full bath. Indeed, it is now found in every well-regulated modern house in our large cities. It is not so expensive but that any one can possess it. Portable baths of rubber, see Fig. 200, can be obtained, which are worth many times their cost. A stationary bath may be made of wood, of the dimensions given, and lined with lead or zinc. There should be an opening in the lower end for withdrawing the water.

The full bath is one of the most refreshing of all baths, being also one of the most pleasant. Employed at a low temperature, it is a powerful means of reducing excessive heat in fevers. The hot full bath very greatly relieves the pains of acute rheumatism, colic, gall-stones, and sciatica, and is almost a specific for colds, if taken soon after their contraction, just before retiring.

Immersion in warm water is undoubtedly the best known remedy for extensive burns. Hebra, the renowned professor of skin diseases at Vienna, has kept patients immersed in the warm bath for periods varying from two weeks to *nine months*, with most excellent results, and, he affirms, without interference with any of the vital functions. Eating, digestion, sleeping, and all the functions of life, were performed in the bath without difficulty or interference.

Very hot and very cold temperatures are quite hazardous with this bath, since it involves so large a portion of the body. Such extremes are rarely useful in any case, and should not be used except under the eye of a physician. We have found that the cold bath is much better borne if the patient is well anointed with vaseline before being placed in the water. The effects are not diminished.

Half Bath.—See Fig. 201. The half bath is much the same as the full bath. A smaller tub is required, as the bather sits upright with his limbs extended. The water should be at least a foot deep. During the bath, the body should be well rubbed, and water should be poured over the upper portion of the body. Its general effects are nearly the same as those of the full bath, and it may be used for the same general purposes. A little more vigorous rubbing is required to prevent chilling, as so large a portion of the body is exposed. It affords a better opportunity for exciting action in the bowels and abdominal viscera by shaking, percussing, and kneading the abdomen.

Fig. 201. The Half Bath.

Shallow Bath.—Of this bath there are two varieties; *sitting shallow* and *standing shallow.*

Sitting shallow differs from the half bath in employing less water, and being much more vigorous. Its effects and uses are about the same. The bather should rub his limbs and the front portion of his body while the attendant pours water over his chest and shoulders, and rubs vigorously his back and sides. A person can take the bath very well alone by using a rather long coarse towel which can be drawn back and forth across the back by grasping one end with each hand. It is a very valuable means of applying water, and is in constant requisition in the hydropathic establishments. From 85° to 90° is the proper temperature for this bath. It may be used at a lower temperature in fever cases. At Bellevue Hospital it is applied at about 70° in such cases, and is administered whenever the temperature exceeds 103°. To avoid the shock of a cool bath, it may be commenced at a temperature little below blood-heat and then gradually cooled by the addition of cool water until the desired temperature is reached. The reduction of the temperature obtained by this means fully equals that obtained by the sudden application of cold, and the shock and subsequent reaction are prevented. This applies equally to all cool baths as well as the cool shallow bath.

The duration of the bath may be from two to thirty minutes. Ten or fifteen minutes will be the usual extent.

The *standing shallow* is in some cases preferred by some to the preceding The patient stands erect in a varying depth of water—

from six inches to one or two feet being employed—while his body is vigorously rubbed by one or two assistants, water being poured upon the chest and shoulders at brief intervals. It is a very enlivening bath.

The shallow bath should be completed by a pail douche at a temperature three or four degrees lower than that of the bath.

Affusion.—This consists simply in pouring water over the body of the patient, who may be sitting or standing in a bath-tub. It is a very efficient bath for reducing unnatural heat. This mode of treatment was used by Hippocrates, Galen, and other ancient physicians. In the last century, Currie, Jackson, and many others used it with great success in scarlatina. It is a sovereign remedy for delirium tremens, sun-stroke, hysteria, and sometimes of acute mania, when applied at the proper temperature. It is used by the Persians in cholera with great success. It is useful in drunkenness and convulsions, and has been successfully used in tetanus.

Pail Douche.—This bath scarcely differs from the preceding. It consists in the dashing of one or more pailfuls of water upon the body of the bather by an assistant. By means of a proper arrangement, the bather can administer the bath himself. For this purpose, a pail or other vessel filled with water may be suspended or supported above the head of the bather in such a way that it can be quickly upset by drawing upon a string attached to the side. The stream should fall upon the shoulders, chest, back, or hips, but not upon the head or over the region of the stomach. This bath may be applied after any warm bath, and should be a little cooler than the bath which precedes it. Whether taken alone or after another bath, it should always be followed by vigorous rubbing.

Cataract Douche.—This is a modification of the douche bath, in which a broad sheet of water is allowed to fall upon the body of the bather. The force of the bath depends upon the height from which the water falls, and should be regulated according to the strength of the patient. Almost any one will bear a fall of three or four feet. When the height of the bath cannot be easily modified, it should be of such an altitude as to be well borne by the feeblest patients; the more vigorous can increase its effects by subjecting themselves to it for a longer time.

The observations made relating to the application of the pail douche apply equally well to this bath.

Jet Douche.—In this bath, water under pressure is thrown upon the patient from a hose, through a small nozzle. The bather turns his body while the attendant directs the stream upon different parts. It is a less pleasant bath than the spray or other forms of douche. Applied locally, it is a powerful means of causing absorption in enlarged glands, as hepatic and splenic enlargements, due to malaria. The alternate hot and cold douche is best for this purpose. It is also excellent in dyspepsia, being applied to the spine opposite the stomach. Its general effects are the same as those of the baths mentioned.

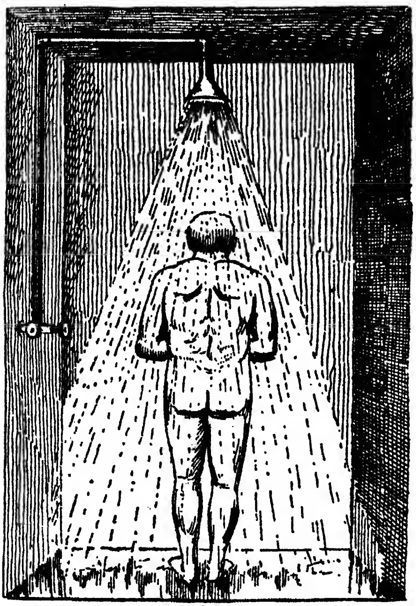


Fig. 202. The Shower Bath.

Shower Bath.—See Fig. 202. This bath is simply an imitation of rain. Water is allowed to fall upon the body after being divided into a number of small streams by passing through a vessel with a perforated bottom. Its effects depend upon the size of the streams and the height from which they fall, together with the temperature of the bath and its duration. Although formerly much employed in water-cure establishments, this bath is now less used, especially the cold shower, because its place is supplied by other more convenient ones which produce the same results, as the spray and douche. The best manner of administering it is to commence the application with tepid water, and gradually cool it. The temperature may range from 70° to 95°. The water should not usually be allowed to fall upon the head, but should be received first upon the hands and arms, then upon the feet and limbs, and afterward upon the back and shoulders, the body being well rubbed during the application.

Every family possesses in the ordinary colander a means of administering an efficient shower bath, by holding it above the patient and pouring in water of proper temperature from a pitcher. A very

simple and effective shower apparatus may be obtained at a cost of a few cents. It consists of a vessel of the shape shown in Fig. 203, having a perforated bottom and a hollow handle at the top, open at its upper end. By sinking this vessel into a pail or tub of water, it will be filled, and will remain full when removed from the water if the finger is placed over the opening in the handle. Upon partially uncovering the opening the watêr will escape in a shower.

Fig. 203. A Simple Shower Bath.

The cold shower bath, formerly so common almost everywhere, has been productive of much injury by its indiscriminate use, and has brought much reproach upon the use of water as a curative agent. None but the most vigorous can enjoy the bath at a lower temperature than 70°, and no advantage is gained by its employment at a lower temperature than that, while considerable harm may be done in many cases.

Spray Bath.—This bath consists of a number of fine streams of water thrown upon the bather, with considerable force. It may be produced by connecting a hose with spray attachment to a force-pump or reservoir from which is obtained water under a sufficient pressure. The best form of attachment consists of a hollow, double-convex brass or copper piece, one side of which is perforated with fine holes, the other side carrying a rim for attachment to the hose. It is preferable to have an arrangement by which the temperature may be readily and gradually changed from warm or tepid to cool without interrupting the bath. In the absence of a proper spray attachment, the apparatus elsewhere described for the hose douche may be made to answer a very good purpose, the stream being broken by placing the thumb or finger over the nozzle in such a way as to partially obstruct the flow.

This is an excellent bath to follow the pack, vapor bath, hot-air bath, sitz bath, or any other general bath which induces perspiration. It is very agreeable to most persons, and can be applied to feeble patients who would be unable to take any more severe form of treatment. The alternate hot and cold spray is very successful as a means

of reducing local inflammations. The warm spray is very grateful and soothing to swollen and rheumatic joints; in gout, also, and illy defined, wandering pains, it is an admirable remedy. The cold spray is very successful in the treatment of glandular enlargements, abscesses, and chronic ulcers, when thoroughly applied.

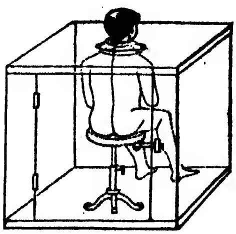


Fig. 204. Vapor Bath.

The Vapor Bath.—As a remedial agent, water in the form of warm or hot vapor is scarcely less useful than in its ordinary form. The vapor bath can be readily and successfully administered with such conveniences as every family possesses. Place the patient in a cane-seat chair, having first taken the precaution to spread over the seat a dry towel. Surround the patient and the chair first with a woolen blanket, and then with two or three thick comfortables, drawing the blankets close around his neck, and allowing them to trail upon the floor so as to exclude the air as perfectly as possible. Now place under the chair a large pan or pail containing two or three quarts of boiling water. Let the blankets fall quickly, so as to retain the rising vapor. After a minute or two, raise the blankets a little at one side and carefully place in the vessel a very hot brick or stone, dropping the blankets again as soon as possible to avoid the admission of cold air. Before the first brick or stone has cooled, add another, and so continue until the patient perspires freely. The amount of perspiration must be judged by the face and forehead, as much of the moisture on the skin beneath the blankets is condensed steam.

Should the bath become at any time too hot, a little air may be admitted by raising the bottom of the blankets a little, being careful to avoid chilling the patient in so doing. The bath should seldom be continued more than half an hour, and fifteen to twenty minutes will usually accomplish all that is desired by the bath. If too long continued, it induces faintness. A too high temperature will be indicated by a strongly accelerated pulse, throbbing of the temples, flushed face, and headache. The head should be kept cool by a compress wet in cool water and often changed. The temperature of the bath should be from 100° to 115°. Unpleasant effects are sometimes produced at 120°.

After this bath, apply the tepid spray, rubbing wet-sheet, pail douche, or full bath. No time should be allowed to elapse after the

blankets are removed before the concluding bath is applied, as the patient will chill. He should not be allowed to become chilly by exposure to cool air before the application of the spray, douche, or other bath, which should be followed by vigorous rubbing.

For "breaking up a cold," "breaking chills," relieving rheumatism, soreness of the muscles from overexertion, and relaxing stiffened joints, this is a valuable agent. It may also be used to advantage in chronic diseases in which there is inactivity of the skin, liver, or kidneys, being a powerful diaphoretic; but great care must be exercised to avoid excessive use, as too frequent repetitions of the bath produce debility.

This is a milder application than the hot-air bath, unless employed at a high temperature, 120° or more, when it becomes more severe.

In institutions where the bath is in daily requisition, a permanent arrangement for giving the bath is usually employed. It usually consists of a box in which the patient sits upon a stool, his head being allowed to remain outside by a suitable opening. A wet towel is placed around the neck to prevent the steam from rising about the head. See Fig. 204.

Steam may be generated by boiling water in the box with a large spirit-lamp or a gas-burner, or it may be conducted into the box by a rubber tube connected with a tight boiler.

The Russian Bath.—This bath resembles the vapor bath, the chief difference being that the patient is wholly surrounded by vapor and inhales it instead of having the head out as in the vapor bath. In a large room filled with vapor, marble or soap-stone slabs are so arranged that the patient, by being transferred from one to another, may be exposed to increasing heat. The temperature employed should be from 100° to 115° F., rarely higher. The effects of the higher temperatures sometimes employed are in no way beneficial, and are often very harmful. The bath is followed by rubbing with soap and cooling with the shower, spray, or plunge bath.

A simple form of Russian bath may be administered in a box or small room prepared for the purpose, which is large enough to allow a person to sit erect, surrounded by the warm vapor, which may be generated in a boiler for the purpose and conducted into the bottom of the box by a rubber or metal tube. An opening guarded by a curtain is made in one side to allow the bather to inhale cool air if he should wish to do so, and to give the attendant access to the patient without

chilling him by the admission of a large quantity of cold air. As in the simpler forms of vapor bath, the head should be kept constantly cool by a cool wet compress often re-applied. Patients troubled with "rush of blood to the head," should be further protected by a large cool compress placed around the neck and the upper part of the chest.

LOCAL APPLICATIONS.

The use of water as a local application is not less important, and is much more varied than its general application. There is no other topical remedy which will produce such a variety of effects and such prompt results. In removing local congestions, subduing local inflammations, allaying circumscribed pain, and restoring activity to inactive parts, the appropriate applications of water give results which afford both physician and patient a degree of satisfaction which no other single remedy can rival, even electricity, an agent of acknowledged power, not excepted.

Sitz Bath.—See Fig. 205. The sitz bath, also known as the hip bath, is one of the most useful baths employed in hydropathic treatment. Its utility was fully recognized by the earlier practitioners, who sometimes kept their patients so long in the bath that they became almost literally water-soaked, and were so numb from the long-continued application of cold water as to possess almost no external sensibility. It is said that in some cases the skin could be rubbed off in the attempts to obtain reaction, without the patient's knowledge.

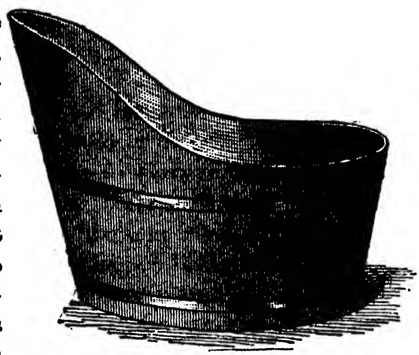


Fig. 205. The Sitz-Bath Tub.

For this bath a common tub may be used, by placing a support under one edge to elevate it two or three inches; but it is better to use a tub made for the purpose, which should have the back raised eight or ten inches higher than the front, to support the back, the sides sloping gradually so as to support the arms of the bather. The bottom should be elevated two or three inches. The depth in front should be about the same as that of a common wash-tub.

Enough water is required to cover the hips and extend a little way

up the abdomen; four to six gallons will suffice. Any temperature may be employed, being suited to the condition of the patient. The duration of the bath will also vary according to circumstances. A short cool bath is tonic in its effects, like all short cool applications; a more prolonged one is a powerful sedative. The hot sitz is very exciting in its effects, if long continued. The warm bath is relaxing. The hips and trunk should be well rubbed during the bath by the patient or an attendant. The bather should be covered with a sheet or blanket during the bath. If sweating is desirable, use several blankets.

The sitz bath should seldom be taken either very hot or extremely cold. A very good plan for administering it, and one which will be applicable to most cases, is this: Begin the bath at 92° or 93°. If a thermometer is not at hand, pour into the bath-tub three gallons of fresh well or spring water, and then add one gallon of *boiling* water. This will give the desired temperature. After the patient has been in the bath ten minutes, cool it down to 85°, which may be done by adding a gallon of well water. Continue the bath five minutes longer, then administer a pail douche or spray, at about 85°, and wipe dry, as directed after a rubbing wet-sheet.

The sitz bath is useful for chronic congestions of the abdominal and pelvic viscera, diarrhea, piles, dysentery, constipation, uterine diseases, and genital and urinary disorders. In treating many uterine and other diseases peculiar to women, it is an indispensable remedy. It is very valuable in various nervous affections, especially those which involve the brain, as cerebral congestion and hyperemia.

There is no better remedy for a cold than a very warm sitz bath taken while fasting, and just before retiring. It should be continued until gentle perspiration is induced.

The sitz may be converted into a general bath by rubbing the whole body with the wet hand while in the bath, and may thus be made to answer the purposes of the half and shallow baths.

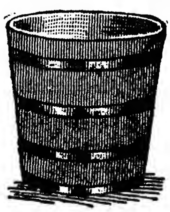


Fig. 206. Leg Bath.

Leg Bath.—See Fig. 206. For this bath, a vessel deep enough to receive the limbs to the middle of the thighs is required. The bath may be taken at any desired temperature; but it is usually employed somewhat cooler than baths which involve the trunk of the body. It is a powerfully derivative bath, and is found very useful to prevent wakefulness in nervous persons, and to

relieve palpitation of the heart, headache, and cerebral congestion. We have found it of great service in the treatment of epileptic patients. It is especially applicable to chronic ulcers of the leg, swollen knees and ankles, varicose veins of the limbs, and limbs which have suffered by exposure to severe cold. It gives much relief in gout; there is no danger of causing a metastasis of the disease by the application of this bath.

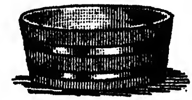


Fig. 207. Foot Bath.

Foot Bath.—See Fig. 207. Any vessel sufficiently large to receive the feet, and enough water to cover them to the ankles, is suitable for this bath. The feet should be rubbed during the bath. If the water is cold, it should not be more than one-fourth of an inch deep.

The alternate hot-and-cold foot bath is a very valuable remedy for cold feet, and is an excellent remedy for chilblains. It is given thus: Place the feet in hot water—100° to 110°—two or three minutes. Then withdraw them and plunge them quickly into a bath of cold water 60° or less. After two or three minutes, restore them to the hot bath. Thus alternate three or four times, and conclude by dipping the feet quickly into cold water and wiping dry. This bath produces most powerful reaction.

The foot bath is applicable in the treatment of headache, neuralgia, toothache, catarrh, congestion of abdominal and pelvic organs, colds, and cold feet. It is very useful as a preparatory for other baths, and as an accompaniment of other local applications.

Half Pack.—This bath is given in the same manner as the wet-sheet pack, except that the wet sheet extends only from the armpits to the thighs. The blankets are wrapped about the patient in the manner described for the full pack. All the precautions given in connection with the description of that bath are applicable to this.

This bath is frequently employed in cases of patients who are too feeble to bear the full pack, or as a preparatory treatment for that bath. It is much milder than the full pack, and is usually more agreeable to the patient, as it does not confine him so closely. It is a very useful remedy in all inflammations of the abdominal and pelvic organs, pleurisy, acute bronchitis, croup, and pneumonia. When a hot application is required, it is well to use a woolen sheet instead of a cotton one. It requires the same after-treatment as the full pack. When applied only to the trunk, the application may be distinguished as the body pack, an extremely useful application in fevers.

Chest Pack.—This application is made in the same manner as the half pack, allowing the wet sheet to extend only from the armpits to the navel. The German method of applying the chest pack is to take a strip of cloth about three yards long, and two to two and one-half feet in width, folded lengthwise, and after wetting in cool, tepid, or warm water, and wringing dry as possible, apply as follows: Place the upper edge of one end close up under the arm of the left side. Pass the bandage across the front of the body and over the right shoulder, then across the back and under the left arm, then across the chest and under the right arm, then across the back and over the left shoulder, making the end fast in front at the point of starting. A dry flannel cloth is then applied in the same manner, and the patient is wrapped warm in blankets. This is an excellent remedy in empyema, chronic pleurisy, some forms of asthma, and pulmonary affections.

Leg Pack.—The pack may be applied to the legs with great advantage in cases of habitual coldness of the feet and limbs or knees. The same principles mentioned in relation to other packs apply to this. The application should be made either cool or cold, and should extend from the hips downward. It should continue from half an hour to an hour and a half.

Chest Wrapper.—This consists of a jacket made something like a vest, reaching from the neck to a little below the navel. It should be made of double thicknesses of soft toweling. To protect the garments or bedding from moisture, it should be covered with another jacket made like it, but a little larger. In applying it, the wrapper should be wet in tepid water, and should then be applied as snugly as consistent with the comfort of the wearer. It should be re-applied every two or three hours, as it becomes dry. The German method described for the chest pack is also used for the chest wrapper, being worn at night only.

If properly managed, the chest wrapper is a valuable remedy; but it has been greatly abused. It should not be worn more than a week without intermission. The practice of some in continuing it until it produces an eruption of the skin, and even longer—to promote a discharge—under the idea that a vicarious elimination is thus performed, is highly reprehensible, and has no sound physiological principle to support it. Such treatment is damaging to the skin, and does the patient no good in any way The better plan is to allow the wrapper to be worn during the night, but omitted during the day-time. If worn during the day, it should be changed often, and should be removed as soon as the

patient becomes chilly. Whenever removed, the surface of the skin should be washed or sponged with cool or tepid water. Feeble patients with defective circulation should wear the wrapper in the daytime only while walking, riding on horseback, or taking some other form of active exercise.

This appliance may be profitably employed in a large number of chronic diseases. In chronic bronchitis, pleurisy, pleurodynia, asthma, and the early stages of consumption, it gives relief.

Wet Girdle.—This was a favorite remedy with the early German hydropathists, and it is a very useful appliance when properly employed, though it has been much abused by excessive use, as in the case of the chest wrapper. To apply it well, a coarse towel about three yards long is the most convenient for use. Wet one-half of this in tepid water, wring until it will not drip, and apply it to the abdomen, placing one end at the side, and bringing it across the front first, so that two thicknesses of the wet portion will cover the abdomen. After winding the whole tightly around the body, fasten the end securely with pins or with tapes attached for the purpose. The remarks made in reference to the wearing of the chest wrapper apply with equal force to the wet girdle. For feeble patients, it is better to wet only that portion of the towel which covers the abdomen.

This is a very efficient remedy for constipation, chronic diarrhea, and most other intestinal disorders. It is equally valuable in dyspepsia, torpid liver, enlarged spleen, and uterine derangements.

Ascending Douche.—This modification of the douche is simply an ascending instead of a descending stream. It can be readily managed by constructing a reservoir in such position as to give the water ten or twelve feet fall, when the requisite force cannot be more easily secured. The water is conducted through a hose, and is allowed to issue through a nozzle near the floor. The patient sits or lies just over the nozzle, and a few inches above it. This is a valuable remedy in treating piles, prolapsus of the bowels or uterus, and constipation.

Drop Bath.—Fig. 208. In applying this bath, a vessel with a small opening in the bottom is elevated to a considerable height, water placed in it being allowed to drop upon the part to be treated. The aperture in the vessel should be only sufficiently large to give egress to a single drop at a time. The bath may also be given by placing in an elevated vessel one end of a skein of cotton yarn, the other being allowed to fall over

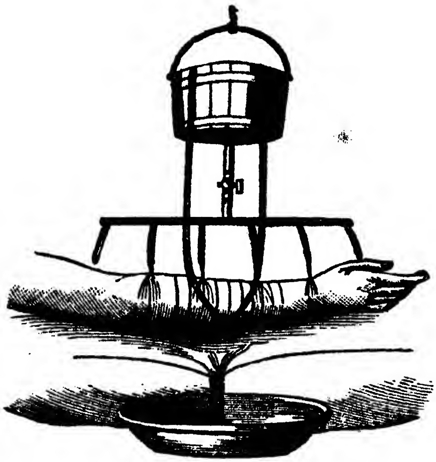


Fig. 208. The Drop Bath.

the edge of the vessel and hang below it. By capillary attraction the water will be drawn up into the yarn, and will drop off at the lower end very slowly.

This is a very convenient way of applying water where its cooling effects are required for a considerable length of time, as in wounds, bruises, sprains, and similar cases. It will "keep down inflammation" in a wonderful manner. It is not commonly necessary that the water should be very cold, as evaporation will keep the part sufficiently cool in most cases.

Arm Bath.—See Fig. 209. This is simply holding the arm in water of proper temperature. It is extremely useful in such painful affections as felons, sprains, and nearly all injuries of the hand and arm. Ulcers and acute and chronic skin diseases of the hand and arm are usually benefited by this bath. If cold water is painful, its application should be preceded by that of hot water, or alternated with it. In case of painful felons, the arm must be immersed to the elbow to relieve the pain, although the disease is only in the finger.

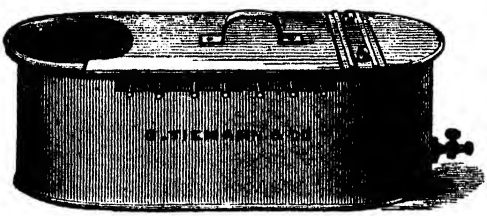


Fig. 209. Arm Bath.

Head Bath.—The patient should lie upon his back, resting his head in a shallow basin of cool water. The attendant should bathe the forehead, face, and temples, during the bath. The bath may be continued until the heat is removed or lessened.

The pouring head bath is often preferable to the preceding. The patient should lie upon a bed or sofa, face downward, allowing his head to extend outward over a tub or other wide vessel, while the water is

poured upon the head from a little height, by an assistant. The water may be either hot or cold, according to existing conditions. Very cold water is not usually advisable, as its application soon becomes painful, and produces powerful reaction. It should be tepid or temperate. Some cases require very hot water for a few minutes, followed by a slight affusion of tepid water.

In hysteria, epilepsy, apoplexy, sun-stroke, acute mania, delirium tremens, and cerebral congestion from any cause, the cold head bath is a promptly efficacious remedy. In many of these cases the pouring head bath is the most effective. The most prompt and almost universal relief will result from the application of the cold douche to the nape of the neck in cases in which persons have had sun-stroke and continued to suffer from headache and dizziness from exposure to the sun, the arteries and veins of the head and neck being too full of blood; in all cases of headache confined to one side of the head; in many cases of roaring or ringing in the ears; in the crowing respiration of children, or false croup.

Eye Bath.—Water may be applied to the eye in various ways. A convenient method when only a brief application is necessary, is to lave the eye with water dipped by the hand. A gentle spray may be applied, or the eyes may be opened and closed in water, thus bringing them freely in contact with the element. Small glass cups made for the purpose may be filled with water and placed over the eye, the water being frequently changed; or wet cloths may be laid upon them.

In applying water to the eye, it is important to be able to first distinguish the exact nature of the difficulty, as much damage may otherwise be done by a wrong application. As a general rule, inflammations of the conjunctiva and *external* structures of the eye require *cool* or *cold* applications, while inflammations of the cornea, iris, and other *internal* structures, require *hot* applications. This rule is often violated in hydropathic establishments through ignorance of the structure and diseases of the eye.

Cool applications are best made by laying upon the eyes thin folds of linen cloth wet in cold water. Not more than two or three thicknesses should be used, as a thick compress soon becomes warm, while a thin one is kept cool for a longer time by evaporation. The compress should be changed every five minutes at least, when there is much inflammation. The fomentation is as good as any method of applying hot water to the eyes. The application, when hot, should be as hot as the patient can well bear. If it affords relief, continue half an hour or more; if it in-

creases the pain, desist at once. The same may be said of cold applications also.

Alternate hot and cold applications will give greatest relief in some cases. After a hot application, a slightly cooler one should always be applied for a few minutes.

A little milk, quince-seed mucilage, or other bland substance, added to the water, makes it more agreeable to the eye in bathing it.

The eye bath is applicable in all inflammations and injuries of the eye, and is infinitely superior to all other eye-washes.

Daily bathing the eyes in tepid water is a good practice for those who use them much in reading, writing, or other work requiring close attention. Many eyes are ruined by neglect and maltreatment.

Ear Bath.—Water applications are made to the ear by means of fomentations, compresses, the douche, or the spray. Compresses and fomentations are useful in inflammations of the structures of the ear, including abscesses which often form in the walls of the external canal. Alternate hot and cold applications are useful in causing the absorption of inflammatory deposits, and thus restoring the hearing. The douche, administered with the syphon syringe, is a valuable means of removing foreign bodies and insects. The warm douche has proved very serviceable in restoring the hearing by removing hardened ear-wax. In administering the douche, the head should be inclined over a basin, while the stream of water is allowed to issue from the nozzle held close to the external opening of the ear. Violent syringing of the ear should never be practiced, as it may occasion irreparable injury.

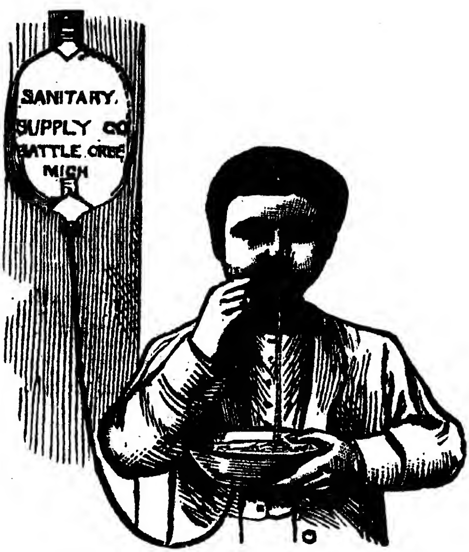


Fig. 210. The Nasal Douche.

Nasal Douche.—This bath is administered either by drawing water into the nose while the mouth is closed, or by injecting it by means

of a syphon syringe. Great care should always be exercised to apply the water gently, as a forcible application will cause pain and irritation. The nozzle should be pointed straight back, while the head is bent forward a little. See Fig. 210. The patient should on no account swallow, as the water may be forced back into the ear and cause injury to the hearing. Injection should never be practiced with a piston syringe, as there is liability of forcing the water into the Eustachian canals. The temperature of the water should be warm or tepid for most applications.

Much benefit may be derived by the proper use of this bath in case of acute or chronic catarrh. Water rendered saline by the addition of salt in the proportion of a dram to the pint of water is less unpleasant than pure water, because it is more nearly like the mucous secretion of the nasal membrane. Drawing cold water into the nose is sometimes recommended for hemorrhage from the nose; but it is of doubtful utility, because the application cannot be continuous, and transient applications of cold water are always followed by an afflux of blood to the part so exposed. The hot nasal douche is a much better remedy for nose-bleed.

Post-Nasal Douche.—So much harm has been done by the nasal douche that some aurists have been led to condemn its use altogether. For many cases the post-nasal douche is preferable. In this application, the water is injected through a curved tube passed behind the soft palate, the fluid being thrown forward and out at the nostrils. More effectual cleansing is obtained by this method than by the first described, but care must be used to avoid irritating the back part of the throat. An irritation at this point may extend to the ears and cause deafness. The syphon and the fountain syringe are the best for giving the nasal douche. The former is represented in Figs. 211 and 212.

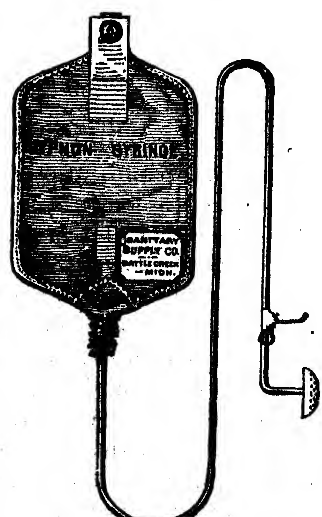


Fig. 211. The Syphon Syringe.

The Uterine Douche.—This very important application of water consists in applying to the uterus through the vagina a gentle stream

of water by means of the syphon, fountain, or Davidson syringe. The force of the stream should not be so great as to occasion the slightest discomfort. The syphon syringe should be elevated not more than three or four feet above the patient; in very sensitive cases, less. The position of the patient should be horizontal, with the hips elevated. The length of time occupied in the bath and the amount of water used will depend upon the condition of the patient. In general, we may say that one to four or five gallons should be used. The temperature of the water must also depend upon the special conditions requiring treatment. In the great majority of cases it should be from 98° to 108° F. In special cases a higher temperature is required. Cold water is rarely or never required.

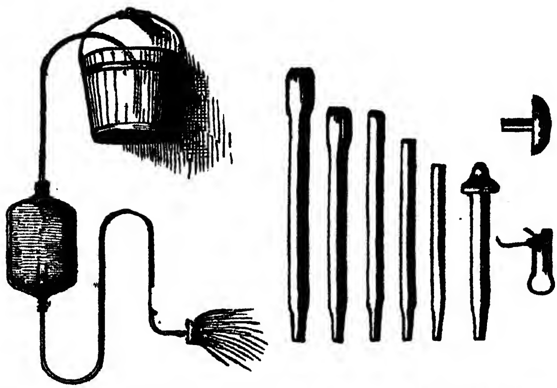


Fig. 212. Syphon Syringe so arranged as to supply a large quantity of water.

The vaginal douche is given in essentially the same way as the uterine douche, the principal difference being that a nozzle having several openings upon the side near the end is employed instead of one with a single opening or two or three smaller ones, at the end.

In Figs. 211 and 212 the syphon syringe is shown in readiness for use, together with the different nozzles used for the nose, ear, and rectum, in applications to these organs. It will be seen by Fig. 212 that the syringe can be made to supply a large amount of water by connecting it with a pail or other vessel in the manner shown.

The uterine and vaginal douche is an indispensable measure of treatment in nearly all diseases of the uterine organs. Its value is far greater than that of any other one remedy in these cases. It removes congestion, induration, the results of acute and chronic inflammation, and relieves leucorrhea, and numerous other morbid conditions of these organs. There is probably no remedy for uterine hemorrhage so eminently useful as the hot local douche. It should be applied at as high a temperature as the patient can bear, which will be 106° to

120° F. In surgical operations on these parts we have felt most deeply grateful for the aid received from this useful measure.

Enema.—Fecal accumulations in the lower bowel are more quickly and easily removed by an enema of warm water than by any purgative, laxative, or cathartic ever discovered or invented; and the use of this remedy is never accompanied with the unpleasant and painful griping and tenesmus which often accompany the use of cathartics. The administration is a trifle more troublesome, but the results are enough superior to more than repay the inconvenience. The syphon syringe is far preferable to any other for administering injections. Water about blood-warm should be used when the purpose is to relieve constipation, and a considerable quantity—one to three pints, or more—may be used. The water should be retained for a few minutes, while the bowels are kneaded and shaken. If there is difficulty in retaining the water, a folded napkin should be pressed against the anus. In hemorrhage and inflammation of the lower bowel, cool or cold clysters should be employed, and should be retained as long as possible. The copious cool enema is a valuable antiphlogistic remedy used in conjunction with the cool bath in cases of violent febrile excitement, as typhoid fever, when the temperature rises above 103° F. Large enemas of water, or of water containing quassia, are the best mode of treatment of ascarides, or the so-called seat worms.

Large, or what are termed forced, enemata are also recommended by Dr. Mosler as the most successful means of relieving intussusception. They are also recommended in hernia and in the treatment of tape-worm, in connection with other anthelmintics. In catarrh and other diseases of the large intestines they are useful in cleansing and washing away acrid secretions and foreign matters as well as in applying local treatment. A. Rôhrick, of Vienna, has observed that injections of water into the colon increase the fluidity of the bile secreted by the liver. This fact has led to its employment in jaundice due to catarrh of the biliary ducts as well as to other causes, and, according to Dr. Mosler, with successful results. In administering a forced injection the syphon syringe should be employed. The patient should lie on his back with his hips elevated, and the enema should be administered slowly. When colicky pains occur, the injection should be withheld for a few minutes, until the pain subsides. When it is desired to force fluid into the small intestine, which may be done in case of necessity, the patient should be placed on his knees and shoulders, so as to lift the pelvis as much as possible, and the fluid should be introduced slowly.

The enema is a most valuable substitute for purgatives in general. Cases are very rare in which a cathartic drug will be found necessary if the enema is properly used. But the enema may become a source of mischief if abused. If habitually relied upon to secure a movement of the bowels for a long time, the bowels lose their activity, and the most obstinate constipation sometimes results, precisely as from the prolonged use of purgatives.

Compresses.—The compress is a wet cloth or bandage applied to a part. The object may be to cool the part under treatment, or to retain heat. The compress may be used with equal success for either purpose. When the part is to be cooled, a compress composed of several folds should be wet in cool, cold, or iced water, as required, and placed upon the part after being wrung so it will not drip. It should be changed as often as *every five minutes*. This is often neglected, to the injury of the patient. A very cold compress may be prepared by placing snow or pounded ice between the folds of the compress. This will not need renewal so frequently; but its effects must be carefully watched, as injury may be done by neglect. In applying cold to such delicate parts as the eye, a very thin compress is better. It should be renewed once in five minutes, at least.

When moist warmth is required, a thick compress is applied, being wrung out of tepid water, and covered with a dry cloth to exclude the air. Soft, dry flannel is an excellent covering. Rubber or oiled silk may be employed when the compress is not to be retained more than a few hours; but if it is to be worn continuously, they will be injurious, as they are impervious to air and thus interfere with the function of the skin. The effects of a compress thus applied are identical with those of the poultice, and the application is a much more cleanly one.

Compresses are applicable in all cases in which poultices are commonly used. They may replace the old-fashioned plasters with profit and comfort to the wearer. The wet-sheet pack, half pack, chest pack and wrapper, leg pack, and wet girdle are all large compresses.

When applied continuously in the same place for a long time, the compress occasions a considerable eruption of the skin, and sometimes boils and carbuncles. There is no particular advantage in these eruptions, and they sometimes do much harm by producing a great degree of general irritation. The notion that they purify the system, though a very popular one, has really a very slight foundation. The discharge is largely made up of elements which would be of great utility if retained

in the system, and the amount of foul matter eliminated in this way is certainly infinitesimal compared with the amount thrown off by a few inches of healthy skin. The skin can always do more and better work when healthy than when diseased. The eruptions are no doubt due to debility of the skin, produced by a too long continuance of the very abnormal conditions supplied by the compress. Yet, strange as it may appear, there are those claiming to be physicians who directly aim to produce inflamed and irritated surfaces by the continuation of the compress for months and even years.

The *wet head cap* is a compress made to fit the head. It should consist of several thicknesses of cotton or linen cloth, so as to retain moisture for some time. It is a good temporary appliance in diseases of the scalp, and for headache; but it should never be worn continuously for the purpose of relieving congestion, as it will have an effect just the opposite of that desired. In eczema of the scalp it may be worn until the disease is cured, being frequently re-wetted. It is an excellent means of preventing sun-stroke and other effects of heat when worn beneath the hat in summer; but even for this purpose its use should be temporary, the cap being worn only during the hotter portion of the day.

Fomentations.—The fomentation is a local application analogous to such general appliances as the hot pack, vapor bath, and hot-air bath. It consists in the application of a cloth wet in hot water. It may be considered as a hot compress. Fold a soft *flannel* cloth twice, so that it will be of three or four thicknesses. Lay it in a basin, pour boiling water upon it, and wring it dry by folding it in a dry towel. Or, if only one end of the cloth is wet, it may be wrung by folding the dry portion outside of the wet; in wringing, the whole will become equally wet. Apply it to the patient as hot as it can be borne. The second application can usually be made much hotter than the first. Frequently dipping the hands in cold water will enable the attendant to wring the cloth much hotter than he would otherwise be able to do.

A better way is to fold the flannel as it is to be applied, and then dip in very hot water, lifting it out by the corner and placing it in the middle of a towel. Roll up quickly lengthwise of the towel, and wring nearly as dry as possible by twisting the ends of the towel. In this way the fomentation can be wrung out much hotter than with the hands. Of course it will be too hot to apply to the bare flesh; but do not waste heat by letting it cool. Protect the skin by one or more thicknesses of flannel and apply at once, covering with another dry flannel. The fomentation

will gradually warm through, and will retain its heat two or three times as long as when applied in the ordinary way.

A still more convenient way is to heat the cloths in a steamer; by this means they are made as hot as boiling water, and yet they are more easily handled, not being saturated with water. When no hot water is at hand, a fomentation may, in an emergency, be quickly prepared by wetting the flannel in cool water, wringing it as dry as desired, folding it between the leaves of a newspaper, and laying it upon the top of the stove, or holding it smoothly against the side. The paper prevents the cloth from becoming soiled, the water protects the paper from burning, and the steam generated quickly heats the cloth to boiling heat. For a long fomentation, the heat may be made continuous by applying a bag of hot meal, salt, or sand, a hot brick or bottle, or, best of all, a rubber bag filled with water may be used,—covered with a moist flannel.

The hot cloths should be re-applied once in five minutes. Two cloths should be employed, so that the second may be applied the moment the first is removed. To retain the heat, a dry flannel, rubber, or oil-cloth should be placed over the fomentation. The application may be continued from ten minutes to half an hour, or longer in special cases. This appliance is very powerful, and should not be employed to excess. Alternate hot and cold fomentations are frequently more efficient than the continuous fomentation. Hot applications should be generally followed by a cool or tepid compress for four or five minutes, or the part should be rubbed with the hand dipped in cool water until the redness produced by the fomentation in part disappears. In neuralgia, gout, and chronic rheumatism, in which the cooling has a tendency to cause a return of the pain, the parts should be covered by dry, warm flannels and so protected from the air. By this means the good effect of the application may be prolonged.

When applied to the head for some time without intermission, it will often occasion faintness; hence, a cooler application should be made after the use of the hot cloths for fifteen or twenty minutes.

If the applications must be continued for a long time, it is well in most cases to apply them at a temperature slightly lower than when they are to be used for only a few minutes.

The uses of the fomentation are very numerous. It is indicated whenever there is local pain without excessive heat or evidences of acute inflammation. Local congestions, neuralgia, toothache, pleurisy, pleurodynia, and most local pains, vanish beneath its potent influence as if

by magic. For indigestion, colic, constipation, torpid liver, dysmenorrhea, and rheumatic pains, it is a remedy of great power, and is used with almost uniform success. In relieving sick-headache by application to the head, neck, and stomach, its efficiency is unrivaled. The fomentation is also extremely useful in cases of great loss of blood, in which fatal syncope may be prevented by making hot applications to the head and so encouraging the circulation of blood in the brain.

Applications of Ice.—Ice may be applied directly to the skin, or, as is usually better, it may be inclosed in flannel, in dried bladders, or better, when dry cold is needed, in a rubber bag. The ice-cap is a double head-cap of rubber, filled with pounded ice.

The application of ice is found extremely serviceable in many inflammatory diseases, and in some nervous affections. In inflammation of the brain, the ice-cap is of inestimable value. Ice applied to the spine will check the convulsive spasms of chorea and hysteria when other remedies fail. In putrid sore throat or malignant diphtheria, ice is a sovereign remedy. It should be applied to the neck externally, and held in small bits in the mouth. Small bits swallowed will sometimes relieve the pains of gastralgia. The application of ice is a useful means of checking hemorrhage. It may be applied over the stomach in hæmatemesis with advantage. It is most effective, however, when it can be applied to the bleeding surface. Applied to the spine it is also most useful in tetanus, in sea-sickness, in the vomiting of pregnancy, and in cerebro-spinal meningitis. Its use in surgery, in preventing inflammation after severe accidents, cannot be overestimated. There is no better remedy for checking the spread of erysipelas. Ice taken internally, by swallowing small pieces of it, is a useful measure in inflammation of the stomach and in fevers.

Some physicians recommend the application of ice to the spine in cases of congestive chill and paralysis. The real worth of such applications in these cases has yet to be determined by careful and repeated observations. We would not advise an unskillful person to attempt to relieve a violent ague chill by rubbing ice on the patient's back, and we have some fears that a very skillful operator would hardly succeed to his entire satisfaction and that of the patient; we have, however, obtained good results from the application of ice to the spine in paralysis.

The snow bath, applied by rubbing the part vigorously with snow, is a useful application for restoring the circulation to frosted parts. In cases of extreme chilling or absolute freezing, there is perhaps no better

remedy. Powdered ice may be used when snow cannot be readily procured.

Water-Drinking.—Baron Liebig and many subsequent observers have shown that the internal use of water powerfully stimulates tissue change, both assimilation and disassimilation, or disintegration, being greatly increased. There is usually a greater increase in the building up than in the eliminative processes, so that a person gains weight under the copious use of pure water as a drink. It was, undoubtedly, for this reason that Banting forbade the use of fluids to those suffering with obesity. It is a valuable measure, and ought to be more frequently employed than it is. It is an admirable thing to give nature an abundant supply of the great cleansing agent, to wash the tissues free from impurities, and thus remove obstacles to the free play of all the vital functions. The amount of water to be taken must depend upon the condition of the patient and the effect desired. A dyspeptic whose absorbents act slowly, can take but small quantities of fluids, and only a few sips at a time. In general, it is better to take but small quantities at once, and to drink frequently. We have ordered patients to drink two or three quarts a day with advantage to them; but ordinarily, one-third of that quantity is sufficient. Care should be taken, also, to take no large quantity within one or two hours after eating. For "bilious" persons, and those whose bowels are very torpid, one to three glasses of water may be taken in the morning half an hour before breakfast. This should not be done, however, by persons with "a weak stomach." The purest water obtainable should be employed, and the temperature should not be too much below that of the body; the temperature of ordinary well water is as low as should be used in any quantity. Iced water, if drank at all, should be taken so slowly that it may be warmed to the temperature of ordinary well water before it reaches the stomach.

Copious water-drinking is a very useful measure for patients suffering from the effects of inactivity of the skin, kidneys, liver, and bowels, and is also eminently useful in cases of defective assimilation. It is a valuable aid in the cure of the tobacco and the opium habit. Cold water, taken frequently, is a most useful means of allaying discomfort and diminishing temperature in fever, when used in conjunction with other remedies. Cold drinks also exert a powerful influence in exciting action in the kidneys. Warm drinks produce an equally marked effect upon the skin. Hot drinks, in very small quantity, are often useful in promoting digestion by exciting to action a

debilitated and inactive stomach. The quantity taken for this purpose should be very small, and it should be taken about half an hour to an hour after eating. The practice should not be long continued, as it will have a tendency to cause increased inactivity on the part of the stomach by producing relaxation of its walls. The fluids drank should not be too hot, not over 102° to 106°, as they may impair the quality of the gastric juice, besides injuring the mucous membrane of the stomach.

When water alone is insipid and is not readily absorbed, the juice of limes, lemons, or other acid fruit may be added.

Water Emetic.—Warm water at about 92°—not hot water—is a most excellent emetic if taken in sufficient quantity. It is prompt in action, and is unaccompanied by the painful nausea, retching, and straining produced by most other emetics. From half a pint to a quart is required to produce emesis. The patient should slowly swallow a tumblerful; then, after two or three minutes, swallow another, so continuing to drink for ten minutes or more. As soon as the slightest disposition to vomit is felt,—or even if it is not felt, after a considerable quantity of water has been taken,—the patient should touch the back part of his mouth with the end of his finger or a feather, as far down as he can reach. This will usually excite the desired action. If it does not, all that need be done is to continue drinking. A little salt added to the water will make it more sickening, and will do no particular harm, as it is thrown out again.

It is not claimed that the warm-water emetic can replace all other emetics in *all cases.* When instant vomiting is necessary, as in cases of poisoning, some more prompt emetic may be used with it. But for all ordinary purposes it clearly has no rival.

Local Applications of Vapor.—Warm vapor may be used to advantage in the treatment of swollen joints and painful parts, especially the different forms of neuralgia. The inhalation of warm vapor is a sovereign remedy in true croup, and is of immense value in nearly all acute and chronic affections of the air-passages, in diphtheria especially, and also in pulmonary consumption in certain stages. In some cases its efficiency is much increased by the addition of some volatile substance, as will be noticed elsewhere under the head of "Inhalations." Local applications of vapor can be made in various ways; but the best are those described in connection with the subject named, when the applications are to be made to the throat or nasal cavity. When the

application is to be made to other portions of the body, it may be effected by means of rubber tubes connected with a suitable boiler. A vapor-bath apparatus generally comprises arrangements that can be used for this purpose. By inclosing the end of the rubber tube in a flannel cloth a continued fomentation may be administered.

Applications of Water in Surgery.—No other remedy is so universally useful in surgery as water. As a dressing for wounds, cool or tepid, it is applicable to nearly all accidental and surgical wounds. Used either very cold,—as in the form of ice,—or very hot, at a temperature of 106° to 120° F., it is the most effectual means of stopping hemorrhage, not requiring the ligature of arteries. Its utility as a remedy for extensive burns has already been referred to under the head of "Full Bath." A few years ago Dr. F. H. Hamilton, of New York City, then professor of surgery in Bellevue Hospital Medical College, called attention to the fact that immersion in warm or hot water was the most effectual means of preventing inflammation, gangrene, or mortification, and promoting the healing of severe injuries to the limbs. By this means he saved many limbs which must otherwise have been sacrificed, and many lives as well. The practice has now been employed by so many others that its utility is fully established. When not convenient to immerse parts, they are kept covered with thick layers of sheet cotton, which are kept saturated with warm water. The temperatures usually employed are 90° to 106° F. No remedy is so excellent for bruises and lacerations as hot fomentations. When applied immediately after the accident, they will often prevent soreness and discoloration almost altogether, hence their applicability in such cases as bruises upon the face and head, or other exposed parts of the body.

MISCELLANEOUS BATHS.

Under this head we shall include a number of different bath applications, in most of which other substances besides water enter, some of neutral character, others possessing properties which occasion considerable irritation or stimulation of the skin. Among these may be mentioned as one of the most commonly used—

Sea-Bathing.—Bathing in the sea is much practiced by fashionable people who make annual visits to the sea-coast for this purpose. It is no doubt useful, though many who participate in it would doubtless receive quite as much benefit if they took as many baths at home

during the whole year as they take at the fashionable watering-places in a single week. It is a fine thing to be well washed once a year, however, if not oftener.

As generally conducted, sea-bathing is usually not more beneficial than harmful. The dissipation accompanying it more than counterbalances what good might be gained. It is rather absurd to attribute any specific virtues to sea-water, as many do. Quite a large business is carried on in the evaporation of sea-water and the sale of the residue, which is again dissolved in water and used in bathing by those who live too far inland to enjoy the benefits of bathing in the sea, or who prefer to take their sea-bath in their own private bath-room. Everything must have a counterfeit, and so this sea-salt is imitated by base swindlers who prepare a mixture of chemicals just as powerful, but not quite so complicated, though certainly equally good. All of this trouble and swindling might be saved if people would only consider for a moment the fact that the chief benefits they receive from sea-bathing are derived from the exercise, the temperature, and pure water, and not from any impurities which the water may chance to contain. At any rate, the same effects may be obtained by adding a liberal quantity of salt to ordinary water employed in bathing. This we frequently do, especially in cases of night-sweats, or of great inactivity of the skin.

Sea-bathing is usually overdone. More benefit will be gained by one or two daily baths than by a half-dozen. Fifty baths in a single week are not equivalent to a single bath in each of the fifty weeks.

Mineral-Water Baths.—Water containing in solution salts of iron, magnesia, or other metallic elements, as well as sulphur, arsenic, iodine, or any compound of these or other elements which are capable of imparting a nauseous or saline taste, an unpleasant odor, or medicinal properties, has been much employed for the cure of all sorts of chronic ailments. Such waters are totally unfit for general use for drinking or cooking purposes, and certainly possess no particular advantage as cleansing agents. Whether they are useful as medicines is a medical question which we do not purpose to consider here; but one would naturally suppose that water which is unfit to cleanse the outside of the body could not be of very great utility as an internal application.

No doubt a great many people are benefited by visiting places of this sort, but it is quite probable that at least a large share of the ben-

efit is derived from the change of scenery, the rest from business, study, or care, together with the influence of the imagination, and the therapeutic influence of bathing, independent of the quality of the water. We would hesitate long before sending a patient to a mineral-spring establishment, for two reasons: 1. So far as the specific virtues of the water are concerned, we could supply the same mineral constituents in more agreeable form if we deemed it best for him to employ those compounds; 2. Almost without exception, those institutions are in the hands of men of very limited medical education. Many of the managers of mineral springs have no exact knowledge of the science of medicine whatever. In short, they are quacks, and utterly incompetent to undertake the professional management of any invalid's case. In consequence of this ignorance on the part of managers, patients are often allowed to do themselves very great injury by excessive drinking of saline and other waters, by too frequent repetition of baths, and by the employment of baths at improper extremes of temperature.

It is an interesting fact in this connection that many of the springs which have attained most notoriety for curative virtues on account of supposed special properties in the water afforded by them have been found, upon examination by experts, to be in no way peculiar except in the remarkable purity of the water furnished by them. It is an equally interesting fact that very soon after the announcement of the extreme purity of the water of any spring, its fame begins to wane, and its waters shortly lose their reputation altogether. A pure-water spring in Maine was for a number of years resorted to by thousands of invalids, thousands of barrels being also shipped away for use in other parts of the country. When a Boston chemist discovered that all the solid constituents—remedial or otherwise—of a gallon of the water could be held upon the point of a penknife, its notoriety speedily diminished.

Robley Dunglison, an eminent medical authority, taught that the beneficial effects derived from the use of mineral waters were the result of "corrected habits of life, the change of air and scene, the rest from labor or dissipation, and the increased amount of aqueous fluid imbibed, which are always associated with the springs." With this we fully agree, as also with the views held by the able editor of the Detroit *Lancet*, who remarks as follows on this subject: "Topers, gluttons of full habit, chronic rheumatics, etc., who are full of waste materials, effete matters, are benefited by drinking large amounts of any

bland water. Their sewers need flushing, and to guzzle from a spring is more fashionable than to do the same thing from the well at home."

This view is still further confirmed by the testimony of Dr. E. Dewey, an eminent physician of Vienna, who in a recent lecture "proved that the human skin is completely impenetrable to the chemical contact of mineral waters, and that therefore the explanation of the effects of baths in these waters at the numerous bathing-places has to be sought exclusively in the domain of physics, and not in that of chemistry. This important discovery annuls all common views regarding the bathing cures effected by the various mineral springs, and explains in the simplest manner that, from a chemical point of view, the action of the most opposite waters must be one and the same."

The Oil Bath, or Inunction.—Inunction was largely practiced by the ancients in connection with the Roman and Turkish baths. It consists in rubbing the skin very thoroughly with some unctuous substance. Olive-oil may be employed, but cosmoline and vaseline, refined products of coal-oil, are much preferable. Olive-oil cannot be obtained pure except at almost fabulous prices. That sold in the drug-stores as olive-oil is really cotton-seed oil and mixtures of lard with various other vegetable oils. We have found pure refined cocoanut oil to be the best of all oils for this purpose.

A warm bath should first be administered. Then dry the patient, as usual, and apply the unguent, taking care to rub it in thoroughly. Simply greasing the surface is not the object sought. The skin and flesh should be worked, rubbed, and kneaded until the oil nearly disappears from the surface. The skin should then be wiped clean with a soft cloth.

The object of this application is to supply the place of defective natural secretion of oleaginous material, to increase the activity of the skin, and to diminish susceptibility to cold. How this is accomplished, readily appears. The oil is a simple substitute for the sebaceous secretion, which is, in a certain class of diseases, notably deficient. The thorough manipulation of the skin which is necessary in applying the oil, and which is facilitated by a lubricant, directly promotes cutaneous activity. Whether the oil itself has any direct effect in increasing the functional activity of the skin cannot be positively affirmed, although it is reasonably supposable that the skin would act more nearly normal when a deficient element is supplied than when it is wanting. Recent experiments have shown that the skin radiates heat faster

when varnished or anointed, and this may account in part for the warming effect of the inunction, as also for the protection which it affords against taking cold after warm baths, as the warm full bath, or the hot-air, Russian, vapor, or Turkish bath.

More than thirty years ago, Dr. Taylor, of London, and Dr. Schneeman, of Germany, published the results of experiments in the use of unguents in the treatment of disease, which attracted some considerable attention at the time, and have since been confirmed by the observations of numerous other physicians. We quote the following from the work of Dr. Taylor, which appeared in 1850:—

"Fever assuming all the typhoid symptoms will be found to change its character completely under this treatment in twenty-four hours. It especially soothes the nervous system, produces sleep, lessens the frequency of the pulse, and correspondingly the thirst. The pulse may be reduced from 120 to 90 in a few hours, after a few applications of the ointment. It corrects the fetid and offensive odors arising from patients. Contagion seldom spreads after its use, very rarely even in crowded rooms; when early employed, the fever is prevented from running into the continued type, and the patient soon becomes convalescent. Finally, it should be observed that it is always at command, perfectly safe, harmless, and is perhaps never contra-indicated."

All of the results claimed by Dr. Taylor have been confirmed by many others. We have found it of great value in the treatment of consumptives, dyspeptics, diabetic patients, and all classes of invalids suffering with dry or inactive skins. It will sometimes produce almost marvelous results in the cases of infants that seem to be wasting away without adequate cause. A few applications will not infrequently occasion a very apparent change for the better which will continue until the child is restored to health. We have also found the remedy of great value in the treatment of scarlatina, measles, diphtheria, and different forms of diseases of the skin. It is very serviceable also in lowering the temperature in typhoid and typhus fevers, pneumonia, and, in fact, all febrile disorders. It is particularly applicable in the treatment of small-pox, alleviating the suffering of the patient by soothing the skin and lowering the temperature. It is believed, also, to have the effect of lessening the liability of pitting and of communicating the disease to others. Some prefer for use in small-pox and scarlatina a mixture of equal parts of olive-oil and lime-water, or carron oil, a mixture which we have used with satisfaction in eruptive

fevers. Inunction has also been used with success in tetanus, being applied particularly to the spine. It will be found of very great service in preventing bed-sores in patients long confined to their beds, for which purpose it should be applied once or twice a day.

Novel Baths.—Many strange substances have been used in the form of a bath, by various nations at different periods, only a few of which are worthy of attention, and those more on account of their novelty than for any practical value which they possess.

The Milk Bath.—With some of the ancient Roman emperors and empresses milk was largely employed as a fancied means of preserving health. It was supposed to have a specially beneficial effect upon the skin. It is still used somewhat for the same purpose.

Mud Bath.—Immersion of the body in warm mud has been a favorite practice at several places in Italy, France, Germany, and other countries. The effects are not very different from those of any warm bath, and are said to be very pleasant by those who have taken them. If the mud were not medicated, this kind of bath would not be especially objectionable for those who could enjoy it. In some instances the mud contains saline and other elements which have a decidedly stimulating effect upon the skin, sometimes even amounting to irritation. Peat and turf are used for the same purpose in Germany, being made into a poultice which is smeared over the body.

Earth Bath.—Burying the body in the moist earth has also been practiced. We have known of one instance in which this remedy was successfully used in the treatment of ague. Sand baths are employed in Blankenberg and Norderney, a hole being dug in the sand and the patient being placed in it and the sand shoveled around him. Spanish sailors used to treat yellow fever by this method; with what success we are not aware.

Bees' eggs, blood, wine, pitch, and *gelatine* have also been employed by different nations, at different periods, in bathing. None of these applications are superior to pure water, which all nature recognizes as the proper material for bathing purposes.

THERAPEUTICAL APPLICATIONS OF TEMPERATURE.

In nearly all of the various applications of water to which we have called attention, thermal influences play a large part. In fact, most applications of water affect the body beneficially or otherwise through

their influence in the modification of temperature. In this section we shall notice only such thermal appliances as have not been already noticed in connection with the description of the several baths.

APPLICATIONS OF HEAT.

The therapeutic indications of heat may be inferred from what has already been said of its physiological action, or influence upon the body in health, so that we need not dwell particularly upon the indications for the use of this important agent, and we shall proceed at once to describe some of the modes of applying heat in which it seems to be the only factor in the effects produced, or what is sometimes termed dry heat.

The Turkish Bath.—In taking this bath the patient is placed in an atmosphere of dry air heated to a temperature of from 120° to 180° F. The bathing apartments usually consist of two or three rooms which are maintained at different temperatures, so that a person may by passing from one to another become gradually accustomed to the extreme heat to which he is exposed before leaving the bath. The room first entered from the dressing-room has a temperature of 120° to 140° F. After remaining in this room for a time, reclining in an easy-chair or upon a sofa, the bather passes into the second room, where the temperature is 150° to 170° F. Sometimes a third room is added in which the temperature is 200° to 240° F.; but this degree of heat is rarely if ever required. The temperature of the bath need not exceed 140° to secure all the good results which can be derived from it, and 170° is much safer than higher temperatures.

The first sensation upon entering the hot, dry atmosphere is to a novice in the use of the bath usually not pleasant; but soon he begins to perspire freely, and the unpleasant symptoms disappear. The profuse perspiration loosens the epidermis, and prepares the patient for the subsequent processes of the bath. After having remained in the bath until the perspiration has been thoroughly established for the desired length of time—varying, of course, with the effect required—the patient is conducted into a room a few degrees lower in temperature, preferably not much above or below 100°, where he is placed on a marble slab and thoroughly rubbed, kneaded, and otherwise manipulated by an attendant for the purpose of removing the dead epidermis and effete matters deposited upon the skin. After this process is thoroughly performed, the attendant applies a thick lather to the whole

surface of the body, and rubs or scours the skin with a flesh-brush or with the hand. In Eastern countries the flesh-brush is not used, and we believe that in general it is unnecessary and often harmful to the skin. After this thorough rubbing and shampooing, the patient is by means of the shower and spray baths gradually cooled to the normal temperature. Usually, after the spray, the bather completes this bath by a plunge in cool water. The latter is unnecessary, however, and on some accounts is objectionable. The graduated shower and spray are milder and better means of securing all the toning up of the superficial blood-vessels necessary.

After being thus cooled, the patient is quickly dried with towels and then enveloped in a sheet, and, if necessary, a blanket also, and lies down to cool in a room in which the temperature is maintained at 70° to 80°. After becoming well cooled, he dresses himself, and the bath is complete. The time usually occupied in the bath is one to two hours. Water should be taken freely before and during the bath to supply the loss by perspiration.

While the heated air is the chief agent in the bath, the rubbing and other manipulations, and the spray and shower baths also, produce beneficial effects. The Turkish bath is one of the most powerful diaphoretics known, and stimulates elimination in a most marked degree. It may be used in such a way as to either diminish or increase flesh. It is a sovereign remedy in acute and chronic rheumatism, rheumatic gout, obesity, dropsy, jaundice, malarial and syphilitic diseases, and numerous other affections. We have broken up what appeared to be typhoid fever in its first stages, with two or three Turkish baths, and consider the remedy almost a specific for remittent and intermittent fevers. Its value in some forms of skin disease, particularly psoriasis and mingled psoriasis and eczema, is very great. It has also been used with success in hydrophobia.

The *Roman Bath* is the same as the Turkish, except that after the patient has been dried after the spray or plunge he is thoroughly rubbed with some sort of unguent. Sweet-oil and vaseline are most often used; we have found a fine quality of cocoanut oil superior to any other. After much rubbing and kneading, which is greatly facilitated by the inunction, all remains of oily matter which have not disappeared from the surface are removed by a towel. Persons who have a very defective circulation and take cold easily are benefited by the Roman bath much more than by the Turkish. It is also a better bath for encouraging assimilation.

Hot-Air Bath.—In administering this bath, prepare the patient precisely as directed for the vapor bath. Instead of placing under the chair a vessel of hot water, place a large alcohol lamp or a small dish containing a few ounces of alcohol. When all is ready, light the lamp or alcohol, and carefully exclude the air. It is hardly necessary to suggest the propriety of putting the lamp in such a position as to insure safety from fire. If alcohol is used in an open dish, it is important to wipe the outside of the vessel quite free from any trace of the fluid, as otherwise it might be communicated to the floor or carpet. Also avoid spilling the alcohol in putting the lamp or dish in place, for the same reason. It is a wise precaution to put the lamp or dish in a plate or shallow dish containing a little water. The hot-air bath should be conducted in the same manner as the vapor bath; but the patient will bear much higher temperatures, as air is a much poorer conductor of heat than vapor. A heat of 130° to 160° F. is not at all disagreeable to the patient. It should be followed by cooling baths as directed for the vapor bath. When perspiration is not readily produced by the hot-air or Turkish bath, the patient should be given a hot full bath or spray bath from three to five minutes and then again exposed to the hot air, when perspiration will start quickly. The vapor bath may be used for the same purpose.

This bath is useful for all cases for which the vapor and Turkish baths are recommended, and is more convenient for use in families, as it can be improvised so readily. It cannot be excelled as a diaphoretic, and is an excellent means of eliminating the poison of malaria, syphilis, and hydrophobia. An English naval surgeon reported through the *British Medical Journal*, several years ago, a large number of cases of syphilis successfully treated by the hot-air bath combined with careful diet.

Local Applications of Dry Heat.—The use of fomentations is often less convenient or desirable than dry applications of heat, which may be made in a variety of ways. Bottles, jugs, or rubber bags, filled with hot water, hot bricks or stones wrapped in papers or cloths, hot cloths, bags filled with hot sand, salt, or corn meal, are all convenient methods of applying dry heat.

A few suggestions with reference to the manner of using hot applications may be useful. In applying heat to the feet when the circulation in those organs is defective, it is frequently insufficient to apply the heat only to the bottoms of the feet. For this reason, jugs or bottles and stones are often applied without effecting any satisfactory results.

A much more efficient method is the following: Heat to a suitable temperature two or three pounds of corn meal or salt. Place the salt or meal in a bag sufficiently large to envelop the feet. After distributing it evenly through the bag, wrap the latter about the feet and cover them with a woolen blanket. A rubber bag partially filled with hot water is an excellent appliance for use in cases of neuralgia, toothache, and nearly all acute pains in the region of the head, as it will conform so perfectly to the shape of the part to which it is applied, and may be used as a pillow.

As a general rule, hot applications should not be continued more than an hour or two, at longest, without at least a transient application of a lower temperature. Too prolonged an application may result in injury to the part.

APPLICATIONS OF COLD.

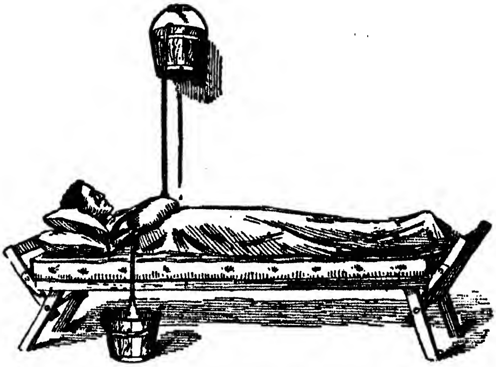


Fig. 213. Application of Continuous Cold to the Chest in Hemorrhage of the Lungs or Pneumonia.

Dry cold applications may often be made when moist cold is not well borne. In such cases, cold water may be used in bottles, jugs, or rubber bags; or pounded ice inclosed in dried bladders or in rubber bags may be employed. For persons who are troubled with burning of the feet at night, cold bottles or jugs afford as much comfort and relief as do hot bags, bricks, etc., to those who suffer from the opposite cause. Dry cold applied by means of the syphon bag, as shown in Fig. 213, is an excellent means of controlling hemorrhage of the lungs, or restraining inflammation in pneumonia.

Freezing.—By means of freezing, parts may be rendered wholly insensible to pain, so that slight surgical operations may be easily performed. When the freezing is long continued, the frozen parts may lose their vitality entirely, which will cause them to slough away. By this means, excrescences,—as warts, wens, and polypi, fibrous and sebaceous tumors, and even malignant tumors, as cancer, may be successfully

removed. Small cancers may sometimes be cured by repeated and long-continued freezing. Their growth may certainly be impeded by this means. A convenient mode of application in cancer of the breast is to suspend from the neck a rubber bag filled with pounded ice, allowing it to lie against the cancerous organ.

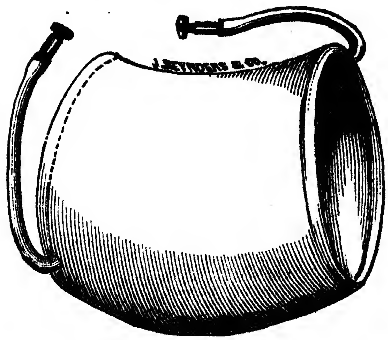


Fig. 214. Double Bag for Applying Continuous Cold to the Knee.

Fig. 215. Ice Head-Cap.

Freezing may be accomplished by applying a spray of ether, by means of an atomizer, or by a freezing mixture composed of equal parts of powdered ice and salt or two parts of snow to one of salt. Mix quickly, put into a gauze bag, and apply to the part to be frozen. In three to six minutes the skin will become white and glistening, when the bag should be removed. Freezing should not be continued longer than six minutes at a time, as the tissues may be harmed, though, usually, no harm results from repeated freezing if proper care is used in thawing the frozen part. It should be kept immersed in cool water, or covered with cloths kept cool by frequent wetting with cold water, until the natural feeling is restored.

Fig. 216. Spinal Ice-Bag.

Felons may often be cured, especially when they first begin, by freezing two or three times. Lumbago and sciatica, as well as other forms of neuralgia, are sometimes almost instantly relieved by freezing of the skin immediately above the painful part. We have cured some obstinate cases of sciatica by this means after other remedies had failed.

AËROTHERAPY, OR REMEDIAL APPLICATIONS OF AIR.

In its broadest sense, aërotherapy includes all remedial applications in which the atmosphere is made the chief agent. In the Turkish and hot-air baths it of course plays a necessary part, but the chief effect is obtained by the application of heat through the medium of the air. That the atmosphere itself is a powerful medium of affecting the system beneficially or otherwise, is evidenced by a large number of facts well known to every one, as the influence of climate, altitude, and other familiar means of securing what is termed "a change of air." It is not, however, to these applications of air that we wish now to refer, but rather to more specific uses of the element, and methods that may be made use of in all latitudes alike. Aërotherapy is still in its infancy, but enough facts have been determined and tested by experience to warrant the conclusion that the air is a potent therapeutic agent for use in certain classes of cases at least.

Air Bath.—The air has a very soothing effect upon the body when allowed to come in contact with the entire surface. It answers a very valuable purpose when a water bath is impossible, or when the patient is too feeble to endure the application of water. A sleepless person will often fall into a sound and refreshing slumber after walking a few minutes in his room with the whole body exposed to the air. The effects of night labor upon literary people may be partially counteracted by the air bath. Benjamin Franklin was accustomed to pursue his writing to a late hour after divesting himself of his clothing, and he recommends the practice to others compelled to labor late with the pen.

The Use of Compressed and Rarefied Air.—What is known as the pneumatic treatment, which consists in the use of compressed and rarefied air, has become quite popular in France and Germany within a few years. This treatment has been little employed, however, in this country, its use having been confined almost wholly to irregular practitioners and quacks, who have employed it in a form which is known as the vacuum treatment. This treatment consists in exposing either the whole or a part of the body to air which has been either compressed or rarefied.

In the application of compressed air to the whole of the body the patient is placed in a small room constructed for the purpose, into

which air is admitted until a pressure of one and one-half or two atmospheres is obtained, the air being withdrawn as rapidly as needed to remove the products of respiration. The patient sits or lies in this room from one or two hours to several hours, according to the effect desired. A cabinet of this kind, such as is employed in Paris, is represented in Fig. 217.

In the cabinet described, the patient may be subjected to the influence of rarefied as well as compressed air; but the use of rarefied air is usually confined to the exterior of the body. For this purpose it is applied by means of suitable receptacles for the arms and legs from which

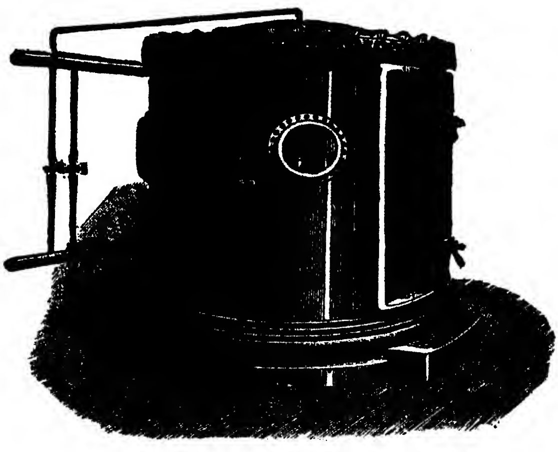


Fig. 217. Pneumatic Cabinet.

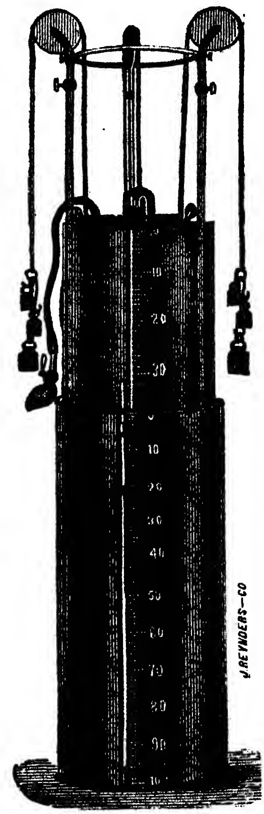


Fig. 218. Apparatus for inhaling Compressed Air.

the air can be partially exhausted. The first impressions produced by the applications of rarefied air, especially when made in the manner last described, are decidedly unpleasant. The same is true to some extent of local applications. Dr. Waldenberg, Professor in the University of Berlin, has devised a portable apparatus by means of which compressed air may be inhaled. A representation of the apparatus is given in Fig. 218. These various devices are chiefly employed in the treatment of diseases of the chest, although the so-called vacuum

treatment has a wider range of application and is said to be useful in the treatment of paralysis, defective development of the limbs, and also as a derivative, relieving the brain and nerve centers of congestion. We have employed vacuum treatment to some extent, and believe it to be a useful agent. Figs. 219 and 220 represent the forms of apparatus which are in use at the Sanitarium. From experiments which we have recently made with Waldenberg's apparatus, represented in Fig. 218, we think it capable of producing most excellent results, especially in chronic bronchitis, asthma, incipient consumption, and other chronic lung affections. It may be used in such a manner as to increase exhalation as well as inhalation, and thus produce a greatly increased development of the chest. The same apparatus used for compressed air may be employed in the inhalation of superoxygenated air, or air which contains more than the usual proportion of oxygen. Various medicated vapors are also employed by this means. The remedial value of pneumatic treatment is less thoroughly established than that of almost any other remedial agent, on account of the small amount of attention which this agent has received from scientific investigators. We believe, however, that it is capable of producing excellent results. In a case of chronic emphysema in which we employed the apparatus, causing the patient to breathe into rarefied air, one-fiftieth of the ordinary pressure being removed, the patient was able to exhale 160 cubic inches of air after an ordinary respiration, though he could ordinarily exhale but 40. A consumptive patient, a young lady with remarkably narrow chest, who could inhale but 30 cubic inches of air, by a few weeks' treatment became able to inhale 120 inches.

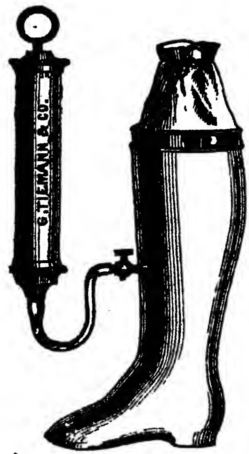


Fig. 219. Junod's Boot, with Air-Pump.

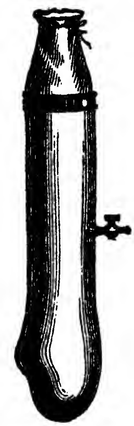


Fig. 220. Junod's Arm.

SUNLIGHT AND INSOLATION.

The value of sunlight in the maintenance and restoration of health, although well recognized, is seldom made of practical utility in the treatment of disease. The important relation of sunlight to health is shown in the effect produced upon plants as well as animals by depriving them of its influence. In caves, mines, and other places excluded from the light, plants do not grow, or, at most, they attain only a sickly development. The same is true of animals. In the deep valleys among the Alps of Switzerland, the sun shines only a few hours each day. In consequence, the inhabitants suffer terribly from scrofula and other diseases indicative of poor nutrition. The women, almost without exception, are deformed by huge goiters, which hang pendant from their necks unless suspended by a sling. A considerable portion of the males are idiots. Higher up on the sides of the mountains, the inhabitants are remarkably hardy, and are well developed, physically and mentally. The only difference in their modes of life is the greater amount of sunshine higher up the mountain side. When the poor unfortunates below are carried up the mountain, they rapidly improve.

The value of sunlight for the sick has been amply demonstrated by hospital experience, which shows a much larger percentage of recoveries in rooms abundantly exposed to the sun than in those excluded from its rays. That the sun has a powerful influence upon the skin is shown by the great increase of pigment, referred to ordinarily as "tan," which is produced by free exposure to the sun and air. This results from an increased activity of the cutaneous tissue.

The sun-bath, or insolation, consists in exposing either the whole or a part of the body to the direct rays of the sun, or protected by a single covering of thin white muslin. In taking the bath the head should be protected from the rays of the sun, as the effects upon the head are ordinarily so powerful as to excite unpleasant sensations. In warm weather the bath may be taken in any inclosed space the top of which is open, admitting the sun in such a manner as to allow it to fall upon a person lying upon a bed or couch within it. Such an arrangement may be easily made of sheets of muslin in the back yard or upon the roof of flat-roofed houses. Ordinarily, however, it is best to have a room constructed in the attic for the purpose, a window being placed in a roof having a south slope in such a way as to make the

sunlight admitted available for three or four hours during the middle of the day. Means should be provided for ventilation, as otherwise the heat within such a room may become too great for comfort and so excessive as to interfere with the efficiency of the treatment. All the benefits to be derived from the use of the sun-bath can be obtained from ordinary glass. During the "blue-glass mania" a few years ago, we made a number of experiments with the blue glass, by which we were thoroughly convinced that the only difference in the effects of different-colored glass, aside from the mental effect upon sensitive patients, is in the modification of the intensity of the rays of light produced by the different kinds of glass.

The length of time the patient should remain in the bath depends on the condition of the patient and the effect desired. Highly sensitive patients, especially when first beginning to use the bath, should remain exposed to the rays of the sun but a short time, ten to twenty minutes usually being long enough. Less sensitive patients, and those who are accustomed to the effects of sunlight, may remain in the bath from half an hour to an hour. The bath should be concluded by a tepid sponge bath or wet-hand rub, as the activity of the skin is greatly increased by exposure to the sun, the patient often perspiring very freely. The effect of the bath is usually to produce a feeling of languor and lassitude. Many patients fall asleep while in it. Unpleasant effects are rarely produced. In cases where they occur, the usual cause is too long continuance of the bath or too great intensity of the sun's rays. To guard against unpleasant effects from the latter cause, it is well to cover the patient at the first of the bath with a sheet, or to draw over the sash through which the light is admitted a screen of very thin material, as gauze or musquito netting. It should be recollected that the solar rays sometimes produce very powerful effects, as seen in sun-stroke, and hence patients should receive careful attention while in the bath.

The Electric-Light Bath.—In 1891 the author had constructed a cabinet upon the inside of which was placed a considerable number (50 or 60) sixteen-candle power electric lights for the purpose of utilizing this source of incandescent heat in lieu of sunlight which is so often unprocurable when most needed. The electric light is, of course, nothing more nor less than a sort of resuscitated sunlight, the coal developed in ages past by the action of mysterious forces upon enormous masses of vegetation which grew under the influence of sunlight, is, through the agency of the steam engine

and the dynamo, converted first into electricity, then into light and heat, thus completing the cycle of utility. This bath has the advantage that it produces vigorous perspiration without subjecting the patient to a hot atmosphere. Sweating usually begins at a temperature of about 85°. It is a very powerful tonic; is of great utility in jaundice, neurasthenia, Bright's disease, consumption, and all cases in which increased skin activity is required. The radiant energy of the incandescent electric-light bath, or radiant-heat bath, penetrates the skin and illuminates the interior of the body.

Use of the Concentrated Solar Rays.—A solar ray consists of heat rays as well as rays of light. It also contains actinic or chemical rays, and its therapeutic effects are doubtless due to the combined influence of these three potent forces. By means of a lens all of these rays may be concentrated, and their potency thereby increased, as illustrated by the well-known properties of the burning-glass. The rays of the sun concentrated by means of a lens have been used in the treatment of obstinate ulcers, discolorations of the skin, and various morbid growths. Undoubtedly, the remedial power of the sun's rays used in this way would be, upon thorough study and utilization, found to be of very great value in a large number of cases.

Ancient Use of the Sun Bath.—There are numerous evidences that the sun bath was not only known among the ancients, but was employed by them to a considerable extent. Plutarch tells us that Diogenes, the renowned Athenian cynic, was, in his old age, accustomed to lie in the sunshine for the purpose of recruiting his energies,—a custom which, according to Pliny, was common among old men in Greece. It is stated that Diogenes valued his sun bath so highly that when called upon by Alexander, who offered to render him any service in his power, he replied in answer to his kind offer, "Only stand a little out of my sunshine." According to Pliny, the custom of the sun bath was common among the Romans. Indeed, both the older and the younger Pliny were accustomed to spend an hour in exposure to the sun daily after dinner. Hippocrates prescribed the sun bath for chills. Numerous other evidences might be cited of the ancient use of the sun bath, but these will perhaps be sufficient. A French physician once said to some people who had brought their children to him for treatment, "Take these children to the country; feed them as well as you can; but, above all, roast them,—roast them in the sun."

ELECTRICITY.

Probably, next to water, no single remedial agent fulfills so many requirements in the treatment of disease as different forms of electricity. It is one of the most powerful agents in nature, for evil as well as good it is true, but, nevertheless, it is capable of being controlled so perfectly as to be made useful in the treatment of a large number and great diversity of conditions. Electricity can be applied in such a manner as to produce its most beneficial results only by a person who is familiar with the physical properties of electricity and the principles and mode of construction of batteries. In order to be able to apply it, it is necessary, in addition, to understand well the structure and functions of the various parts of the body, particularly of the nervous system, and also to be well acquainted with the effects of electricity upon each of the several portions of the body in health. To become possessed of this knowledge requires long study and experience.

We have not space in this volume, in which so many different subjects are considered, to attempt anything like a thorough treatise upon the nature and medical uses of this powerful agent. All we shall attempt to do will be to point out some of the principal modes of application, and mention a few diseases and morbid conditions to which it is especially applicable. We are led to do this particularly as we have many times been requested by patients who have been benefited by the use of electricity under our care, to give them instruction in its employment, so that they might continue its use after returning to their homes, and retain the benefit which they had received. While we do not, in general, recommend the self-application of electricity, yet the request referred to has come many times from persons whose intelligence and quickness of perception, together with their personal experience in the application of the remedy, from having been some time under treatment, rendered them entirely competent, with the proper instruction, to continue at least the particular mode of application which had been found most beneficial in their particular cases. The principal kinds of electricity to be employed are known as the galvanic, the faradic, and the sinusoidal currents and static electricity.

Galvanic electricity as used in medicine is produced by chemical reactions taking place in a battery composed of several cells. The strength of the current depends on the size of the cells, and the number employed. The galvanic current is sometimes furnished by dynamos.

Faradic electricity is produced by passing the current from a very

weak galvanic battery consisting of one or two cells through a coil of wire arranged around an iron bar. By this simple device the intensity of the current is very greatly increased. By using several coils, one outside of the other, a very high degree of intensity can be produced from a very weak galvanic current.

The Sinusoidal Current. — This is an alternating magneto-electrical current. Attention was first called to its special therapeutic effects in 1888, in a paper read before the American Medical Association by the writer, who at that time had been employing this

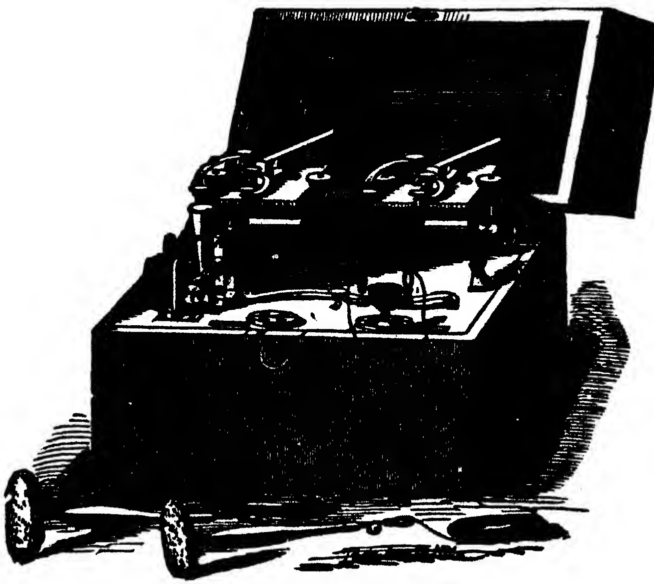


Fig. 221. Faradic Battery.

current therapeutically for some five years. Three or four years later, attention was called to it by Prof. d'Arsonval, a pupil and assistant of the eminent physiologist, Prof. Brown-Sequard. Prof. d'Arsonval pointed out the fact that the peculiar properties of this current are due to the uniformity in the variations of current strength. The apparatus perfected by the writer for this purpose is illustrated in Fig. 222.

This apparatus, manufactured by the Sanitary and Electrical Supply Co., Battle Creek, Mich., possesses the following advantages over the faradic and galvanic currents: —

1. It produces physiological and therapeutic effects of a most decided and important character, which are not obtainable from any other form of electrical apparatus.

2. Aside from the galvanic current, it is the only form of electrical apparatus which affords a means of exact and accurate dosage, or the only apparatus with which accurate dosage, variable within large limits, is possible. The strength of the current can be measured

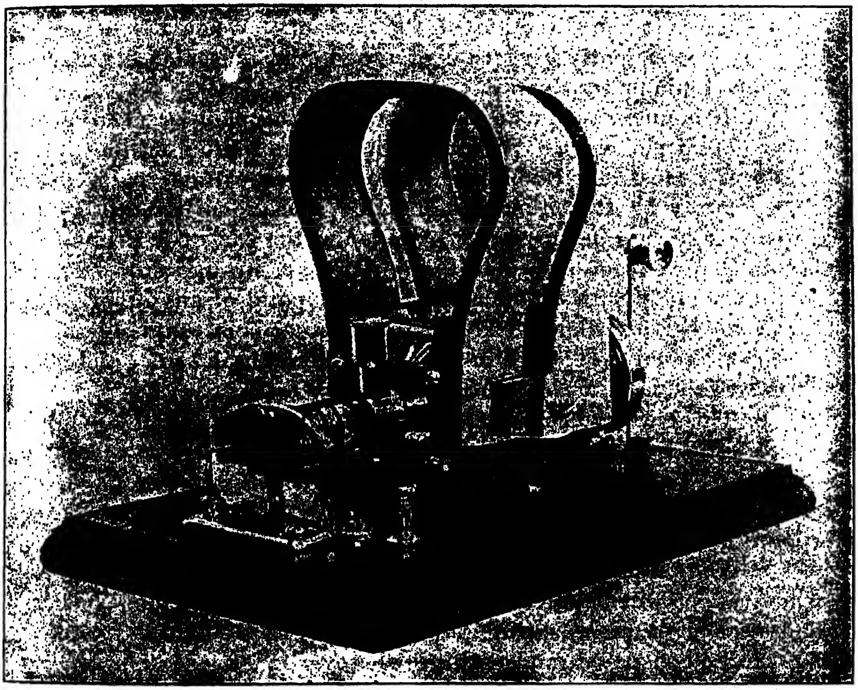


Fig. 222. Sinusoidal Electric Apparatus.

by the milliamperemeter the same as that from the galvanic battery. It is only necessary, when using the alternating current, to adjust the switch for a few seconds in such a manner as to commute the alternating current into a direct current, taking note of the indication on the milliamperemeter.

3. Its therapeutic applications are painless.

4. It affords the most efficient means possible for exercise of

the muscles, producing marked muscular contractions without pain. It may even be applied in such a way as to throw all the muscles of both extremities into violent muscular movement without other sensation than that of motion. The muscular effect may be localized to the nicest degree, confined to a single set of muscles in the face, or to a thumb or finger, bringing each muscle into efficient action without affecting others. When the apparatus is rotated slowly, a current is produced which gives a vigorous muscular contraction at each change in the direction of the current. When the apparatus runs at a sufficiently high rate of speed, the muscular contraction becomes tonic or continuous.

5. It is unexcelled as a means of relieving pain or exciting the nerves of special sense. When applied to the region of the eyes, it produces a most remarkable light phenomenon without pain, prickling, or any of the other disagreeable sensations induced by the galvanic and faradic currents. Applied to the ear of a person who is totally deaf from disease of the middle ear, strong impressions of sound are made without the production of pain, or any other sensation than that of sound. This current succeeds in relieving pain in a large proportion of cases in which the galvanic, faradic, and static currents fail.

6. This current has a larger range of adaptability than any other.

7. The first cost of the entire apparatus is less than that of other first-class electrical outfits, while the effects obtainable are much more varied, and of a character not approached by any other apparatus.

8. The apparatus may be maintained without any expense whatever, as when the machine is used with a permanent magnet and runs with photo-spring power, there are no battery plates or fluid to be consumed, and nothing whatever to get out of order. It is always ready to give its maximum current, and any lesser current desired.

9. The apparatus is provided with a commutator, by which the alternating current is converted into a direct current capable of producing all the effects of an ordinary direct or galvanic current, such as electrolysis, cataphoresis, and other polar effects. It is much more agreeable in its application than the ordinary direct current, for the reason that the construction is such that a gentle sinusoidal current is superadded to the direct or galvanic current,

thus producing a very desirable combined effect, the advantages of which have been pointed out by the writer in the "International System of Electro-Therapeutics."

10. The large capacity of this apparatus is shown by the fact that it will light an ordinary 16 C. P. electric lamp.

11. The sinusoidal apparatus is extremely convenient. It is always ready for use, and the several different currents can be obtained by simply moving a switch and without adjustment of the conducting cords.

12. It is provided with a perfect speed regulator, and the current is controlled by a simple rheostat, as any other electrical current.

13. It furnishes all the desirable effects to be obtained from both the galvanic and the faradic batteries, together with a large number of other effects which are not approached by any other apparatus.

14. It requires no cleaning of cells and brightening of contacts, gives no unpleasant fumes, does not get upset, destroying carpets and other furniture, and never produces disagreeable or undesirable effects.

The Galvanic Current.— During the last ten years, great advances have been made both in apparatus and in methods for the use of electricity. The direct, or galvanic, current is now frequently furnished by dynamos instead of by storage batteries. Dry cells and other convenient means of furnishing the galvanic current have been devised, and in addition, rheostats for controlling the current, and milliamperemeters, voltmeters, and coulombmeters are now in use by skilled electro-therapeutists everywhere, experience having shown that extreme accuracy in dosage is necessary in the use of the galvanic current, to secure definite and tangible results. By means of these methods of precision, it is possible to employ much stronger currents than formerly, the quantity being known and the effects of stronger currents having been determined by careful experimentation. The strong currents are especially useful in the destruction of tumors, particularly tumors of the womb, the suffering from which is almost universally alleviated by skillful applications of the galvanic current, if made often enough and of sufficient strength. The galvanic current is also used for the removal of abnormal growths of hair, and for powerfully affecting the nerve centers of the brain and spinal cord.

The Faradic Current.— This current has been much more

generally employed than the galvanic. It is more sensibly felt in small quantities, and thus appeals more vividly to the imagination of the patient. The effects of the faradic current are chiefly superficial, affecting the internal organs only secondarily by reflex action. The chief faults of the faradic current are its irritating effects, the impossibility of exact dosage, and the readiness with which the apparatus gets out of repair.

The Sinusoidal Current.—Little need be added to what has already been said with reference to this current, except that it is a most valuable means of relieving pain, or stimulating the nerves by exciting the muscles to vigorous action, thus producing passive gymnastics, and is of very great service in the treatment of the disorders of digestion and of diseases peculiar to women.

The following simple directions with reference to the use of the different forms of current may be found useful :—

APPLICATIONS OF FARADIC ELECTRICITY.

General faradization may be applied in two modes (Fig. 231) :—

1. For tonic effects. The application consists in brushing the surface of the body, one pole being stationary, placed at an indifferent point.

2. For motor effects : *a.* One pole stationary placed at an indifferent point, the other applied to the motor point. *b.* Small electrodes being employed and applied near together directly to the muscles themselves, or one applied to a motor point while the other is applied to the muscles.

General Faradization for Tonic Effects.—Apply a large, flat sponge over the abdomen. The other electrode should be a soft sponge three or four inches in diameter. The sponge should be moistened with salt water, as a general rule, for the faradic and sinusoidal currents, but not for the galvanic. The weaker electrode should be connected with the flat sponge, the stronger electrode with the round sponge. The whole surface of the body should be brushed with the stronger electrode or round sponge.

With the patient lying upon the back, proceed as follows : Place one hand, moistened, upon his forehead, then touch the tip of the fingers to the round sponge, the flat sponge being placed upon the abdomen ; if the patient can stand more current, grasp the sponge more firmly with the hand until the patient feels a gentle prickling

sensation. After holding it for a few seconds (say long enough to count 10 or 15), move the hand down one side of the face, then the other, taking care to keep the whole flat surface of the hand in contact with the skin continually. Avoid concentration of the current in the tips of the fingers, as this will give the patient an unpleasant sensation. In concluding the application, do not break the current by withdrawing the hand from the head, but by withdrawing the other hand from the sponge.

Next, beginning at the head, brush the neck, first on one side, then the other. Then brush systematically the surface of the chest, first in front, then at the sides. Then brush the arms, first the inner aspect, then the outer aspect; first one arm, then the other. Then extend the treatment to the abdomen, legs, and feet. Then have the patient turn over upon the face, and apply the sponge to the back, beginning at the head. The sponge should also be applied to the back parts of the shoulders and arms, which are not easily reached from the front. Then treat the hips, thighs, and legs. The sponge should be brought in contact with all parts of the surface. Care must be taken to avoid bringing the sponge in contact with points at which the bones come near the surface. Especially avoid the following points: clavicle, sternum, shoulder-blades, elbows, ribs (in persons who are thin), spine, crest of the ilium, knee-cap, tibia.

General Faradization for Motor Effects.— *a.* A large flat electrode is applied to any indifferent point, while a small sponge electrode (not more than one inch in diameter), connected with the stronger pole, is applied to the motor point. Applications are made systematically, taking first the right arm, then the left arm; next the right leg, then the left leg; lastly, the anterior surface of the trunk, then the posterior surface. (See page 1085 for motor points.)

Faradization of Motor Points.— *b.* Use small electrodes, applying near together, either both to the muscle or muscular group, or one to the muscular group and the other to the motor point. When one is applied to the motor point, the other electrode should be applied as nearly as possible to the geometrical center of the muscle or group of muscles supplied by the nerve. When both electrodes are applied without reference to the motor point (which is sometimes the most satisfactory method, especially with very fleshy

persons in whom the motor points cannot always be easily located), the two electrodes should be placed on opposite sides of the muscles and adjusted so as to pass the current, as nearly as possible, through the geometrical center of the muscle.

LOCAL FARADIZATION.

This is applied chiefly as follows: —

1. To motor points. The stronger electrode is placed over the motor point, the other is applied over the muscle to which the nerve is distributed.

2. To a muscle or muscular group. One electrode is placed on each side of the geometrical center of the muscular mass.

3. To painful points, as in coccygodynia, in which one large electrode connected with the weaker pole is placed at an indifferent point, the other electrode of sufficient size to cover the painful surface being placed over the seat of pain, and a current passed as strong as the patient can bear, and increased in strength at each application. The time should be twenty to thirty minutes.

4. To special organs, as when a rectal or vaginal application is made by means of special electrodes, one pole being connected with a large sponge electrode placed at an indifferent point.

The most common applications, besides those mentioned, are to the eye and ear.

MODE OF USING THE GALVANIC CURRENT.

1. See that the battery is in order.

2. See that the rheostat is in order. Test it by means of a voltmeter or milliamperemeter, or in the absence of either, by holding one sponge in the hand and touching the other to the head, with a very small amount of current. The current should not be applied to the head of a patient without first applying it to one's own head. Test the rheostat by noticing whether any current is indicated by the milliamperemeter or by sensation, also observing whether the current comes on in too great quantity when the rheostat is brought into use.

3. *Electrodes.*— Sponge, clay, gelatin, and metal electrodes may be used. Fine sponge electrodes may be used for currents of moderate quantity The sponge is not suited for currents of more than

forty or fifty milliamperes. The same remark is true when currents of the quantity named are employed.

Clay electrodes have the advantage over sponge in that they secure perfect contact with the skin and an even distribution of the current. Clay electrodes have a metal back.

Gelatin electrodes containing red or white lead, plumbago, or similar conducting material, are more durable than clay, can be used several times, are equally good conductors, and make even better contact.

Metal electrodes are used only when electrolytic effects are desired. In the treatment of tumors and aneurisms, needles are often employed for one or both poles.

Applications.—The principal applications of the galvanic current are known as central galvanization (CG), local galvanization (LG), and galvanization of the sympathetic (GS).

In *central galvanization*, one sponge is large, the other small. The large sponge is placed over the abdomen, the small sponge placed first at the top of the head for two minutes, then just above the sternum, pressed deeply in for one minute, then passed slowly down from the base of the brain to the last lumbar vertebra. Repeat from three to five minutes.

In *local galvanization*, the electrodes are applied in a number of different ways:—

1. One electrode, the large one, at an indifferent point, the other at a motor point or over the central part of the muscle. When motor effects are desired, the current must be interrupted.

2. The two electrodes may be placed, one at a motor point, the other over a related group of muscles, the current being interrupted; or the two electrodes may be so placed as to direct the current transversely through the geometrical center of the muscle.

3. In applying galvanism locally to an internal viscus, two electrodes are placed one on each side of the body, the size of the two sponges being proportioned according to the location of the organ. When near the surface upon one side, the electrode upon that side will be smaller. The smaller the electrode, the nearer the surface will be the point at which the lines of electrical force are concentrated.

Galvanization of the Sympathetic.—In galvanization of the sympathetic, apply an electrode of sufficient size to extend from the

lower end of the sternum to two inches below the umbilicus and six inches in width. The other electrode should be applied to the back of the neck, extending from the base of the brain down to an inch below the vertebra prominens. After five minutes, move the electrode placed at the neck to the dorsal region opposite the abdominal electrode; let it remain five minutes. In conclusion, replace the spinal electrode by a small sponge electrode, and, lessening the current, apply the sponge along the border of the sterno-cleido-mastoid muscle from the skull to the top of the sternum, first one side and then the other, for two minutes each. The amount of current during the application to the neck and spine should be from 40 to 60 milliamperes. When applied efficiently, the effect is usually to produce an increased flow of saliva.

APPLICATION OF THE SINUSOIDAL CURRENT.

1. Study the apparatus and the mode of regulating it for rapid and slow currents, also the alternating and the galvanic currents.

2. Test the rheostat and see that it is in perfect order, as this current is not so easily controlled as either the galvanic or the faradic.

3. The sponge electrodes are well adapted for this current. They should be very thoroughly moistened, and made of fine sponge.

In the use of the sinusoidal current, the slow current is used for motor effects, and the rapid current for sedative or stimulating effects. In making the application for motor effects, one electrode may be applied at an indifferent point, the other at a motor point; or one electrode may be applied over the central portion of the muscular mass; or the two electrodes may be applied near together, as this current easily produces muscular action. Vigorous muscular action is generally produced if the electrode is placed even approximately near to the muscular group which it is desired to bring into action, or to the motor point controlling it.

For the relief of pain, a flat electrode of proper size is placed over the painful point, a large electrode being placed at an indifferent point, a rapidly alternating current being used, of sufficient strength to produce very slight sensation; or in case of applications to the head, the strength of the current should only be suf-

ficient to produce light effects without producing any sensation of the skin.

Conducting Cords.—These are usually composed of several twisted or braided copper wires covered with silk. When the battery is used very much, the silk frequently becomes worn so much that the wire is easily broken. On this account it is well to pass the wire through a small rubber tube, which will act as a protection without doing it any injury. One advantage is that the wire will be kept dry, so that it will not communicate electricity to the hand or other parts of the body of the patient or operator which it may fall upon, as it may do when uncovered.

Electrodes.—In addition to the copper plate to which reference has already been made, which is applied to the feet, several sheets of copper of different sizes and shapes may be used for lengthy applications to different parts of the body. One, for instance, a plate the size of the hand, may be used for applications to the back or to the pit of the stomach, the same plate or a larger one may be used for applications to the abdomen. Electrodes of all shapes and sizes can be obtained of the manufacturers of batteries. Metal electrodes should never be applied directly to the skin, a covering of cloth or a sponge moistened in water always intervening. Some electricians use salt water for moistening the electrodes, as it is a better conductor of electricity than ordinary water. The metal electrodes should frequently be scoured, as the electric current causes rapid corrosion to take place. They should be kept bright and clean. Care should also be taken to thoroughly cleanse the cloth and sponge covers by boiling and thoroughly washing in a solution of soda or chlorinate of soda.

When very strong galvanic currents are employed, as for electrolysis for fibrous tumors of the womb, electrodes should be composed of moistened clay, or a mixture of gelatin with red lead. The latter electrode, devised by the writer, has been found very serviceable. In the employment of the galvanic current, the only fault is, too weak a current is generally used, so that no decided effects are produced.

A galvanic battery is shown in Fig. 223, which represents the form manufactured by the Galvano-Faradic Co., of New York. This battery we have employed for a number of years with entire satisfaction, and can recommend it to any one needing a battery of this sort. It is much more difficult to care for and requires much more

experience in its use than the faradic battery, and hence is not well adapted to use by persons who have not had special training for the purpose. On this account we shall give no description of the mode of using or caring for the apparatus. Fig. 224 represents the battery which is used for galvano-cautery in the removal of tumors and other morbid growths. It is of course useful only in skilled hands. Figs. 225 to 230 represent some of the different instruments used in the application of electricity to various parts of the body.

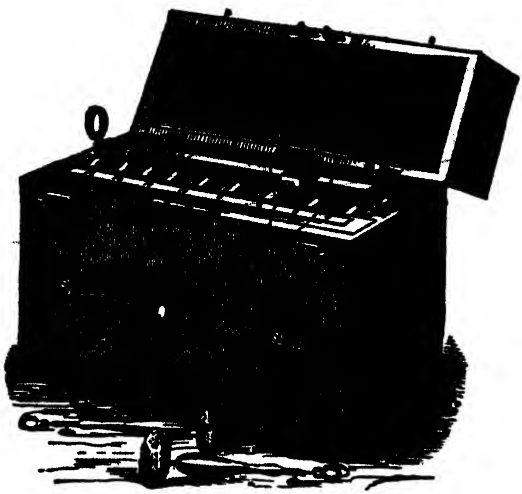


Fig. 223. Galvanic Battery.

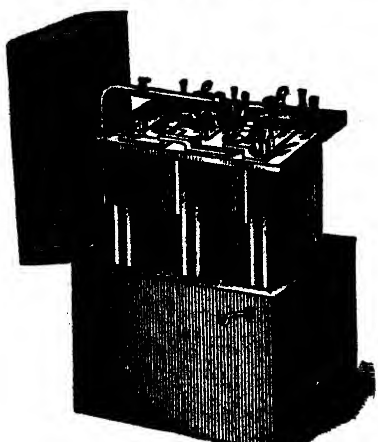


Fig. 224. Galvano-Cautery Battery.

The Effects of Electricity.— Probably no other agent has so powerful an effect upon the human system as electricity. Its general influence is to increase vital activity. Just how this is accomplished is not known. Its close resemblance to what is known as nerve force, has led some to believe that nerve force and electricity are identical, but numerous facts and experiments show that this cannot be true. It does not act as a stimulant, however, as there is no reaction from its proper use. Its effect seems to be that of a corrector of the vital actions. An organ which is acting too slowly will be quickened by it to increased activity; while one that is in a state of morbid activity, under the

influence of electricity may be restored to its normal functions. It acts directly upon the several tissues of the body through which it is made to pass, and also through the medium of the nervous system. It is probable that its principal effects are produced in the latter manner. We have not space to describe its effects upon the body in health, upon which its remedial applications are based, and will content ourselves with a brief description of the principal modes of applying faradic electricity, and some of the principal diseases to which it is applicable.

Fig. 225.

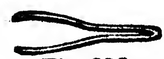


Fig. 226.

Fig. 227.

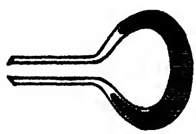


Fig. 228.

Fig. 229.

Fig. 230.

The following rules should always be observed in the application of electricity: —

1. Use the mildest currents with which the effect desired can be obtained. No benefit and much harm may be caused by the use of too strong currents. Special care should be taken in the case of sensitive and nervous patients, especially at the outset.

2. Avoid passing the hand or sponge over portions of the body where the bones come near the surface, as the scapula, the skull-bones, the sternum, the elbows, the patellæ, the prominences about the hips and ribs, and other places where the bones are scarcely covered with flesh. The pains produced when electricity is applied to these parts, often cause serious irritation and alarm to patients who are unaccustomed to the use of electricity, and are likely to discourage them from continuing its employment.

3. Applications should at first be very short, and it should be regarded as a general rule, with few exceptions, that short applications

frequently repeated are much more effective than long ones at greater intervals. From five to twenty minutes is usually sufficiently long for an application in any ordinary case.

4. No attention should be paid to the slight muscular soreness which often follows the first two or three applications of electricity, as these will speedily pass away as the patient becomes accustomed to the use of this agent. The same may be said of the increased nervousness and irritability sometimes noticed in patients beginning the use of electricity.

Fig. 231. Administering Electricity.

5. It is also specially important that the patient's nervous system should be in a quiet condition during the application. If his interest and confidence are fully secured, its effects will generally be much more marked than if the contrary is the case. This fact is true with reference to nearly all remedial agents, but more especially of electricity than of any other.

Static Electricity.— Within the last twelve or fifteen years there has been a remarkable revival of interest in a form of electricity which was used in the treatment of disease long before any other, and indeed, before any other form of electricity had been discovered; viz., so-called frictional, or Franklinic, electricity. The electricity is generated by friction and induction combined. Recently very powerful machines have been constructed. The largest machine of this sort in the world is the one in use at the Battle Creek Sanitarium, which consists of six large revolving plates, between four and five feet in diameter. The effect of this current, when applied to the body, is to produce a strong electrical state of the entire body. Generally the hair stands on end as an evidence of the profound influence of this apparatus upon the body. Static electricity is used

chiefly in the form of breeze, charge, and sparks. We have seen most excellent results from this mode of applying electricity, and shall continue to use it as a therapeutic curative measure.

Electricity is applicable—and more usually with success—to nearly all the curable diseases to which the human system is subject. It may also be used in incurable cases for the purpose of palliating symptoms which cannot be wholly relieved. For this purpose it is one of the most successful remedies known. It is especially applicable in cases of obscure nervous disorders in which a diagnosis cannot be made out with absolute certainty, as in these cases it proves of value more frequently than any other agent, and if intelligently applied will certainly do some good and can do no harm. Excellent results may be expected from the use of electricity in diseases due to or associated with general debility of the vital functions, impairment of nutrition, such as dyspepsia, neurasthenia, or "nerve-tire," nervous debility, anemia, hypochondriasis, hysteria, chronic rheumatism, paralysis, chorea, some forms of skin disease, epilepsy, and various light affections. In the forms of disease mentioned, general faradization should be used.

Local faradization is indicated in all diseases which are dependent on a local cause, which include some forms of local paralysis, most cases of neuralgia, sprain, and other local injuries, diseases of the eye and ear, and disease of the larynx and lungs. Local applications are also exceedingly useful in painful affections of the stomach and bowels, and particularly in neuralgia of the abdomen and pelvic organs, and local affections of the reproductive organs. Local applications are also frequently used in combination with general faradization to increase local effects, as in special application to the joints in chronic rheumatism, and to the stomach in nervous dyspepsia.

The Electric Bath.—Electricity may be combined with water and other agents in a variety of ways. The simplest form of electric bath may be applied in connection with the foot and sitz bath by placing in the foot bath the negative pole and applying the positive pole as directed for general faradization, keeping the sponge very wet, so that a sponge bath is really administered to the patient at the same time with the electric current.

A better form of the electric bath, when general effects are desired, may be administered in an ordinary wooden full-bath tub. The copper or zinc plates may be placed at each end of the bath, with which

the positive and negative poles of the battery may be connected,—the positive to the head, the negative to the foot. The back of the patient should be supported while in the tub by a sloping board of the width of the tub, and having in the center a slit four or five inches in width, so as to allow the passage of the electric current through the body. A still better plan is to place under the back of the head and neck a large sponge with which the positive pole may be connected as in the sitz bath, and the negative pole may be connected with the body by means of a sponge electrode used on the patient in essentially the same manner as directed for general faradization. Both methods are, however, rather crude, and only very imperfect results can be obtained from such forms of bath. To administer the bath successfully, securing the best results, a special bath apparatus is necessary.

The Use of the Galvanic, Faradic, and Sinusoidal Currents in the Bath.— The bath may be either bipolar or unipolar; that is, both electrodes may communicate with the body in the water, or one may reach the body through the water while the other is in contact with the body outside the water. As generally used, the bath is usually bipolar. The faradic or sinusoidal bath consists of the following steps: —

1. The current is passed from head to feet for one or two minutes, while the patient is rubbed in the bath by the attendant.

2. The current should be strong enough so the patient will just distinguish a tingling sensation. Patients bear the bath a little stronger when they have become accustomed to its employment.

3. Transverse currents should be passed from the shoulders down to the legs. The transverse current may be passed in two ways, one electrode communicating with the feet while the other is connected with both sides of the tub; or one electrode may be upon one side of the tub, and the other upon the opposite side.

4. Have the patient sit up, and by means of a sponge and dipper apply the current to the spine. If a sponge is used, it should be very wet. The current must, of course, be moderate. In the use of the dipper, the strength of the current can be regulated by the length of the stream of water, or the distance between the dipper and the body, also by the size of the stream. Considerable skill is required to use the dipper properly.

5. The current is withdrawn, the patient lies in the tub, and the water, if the patient is inclined to be cold, should first be warmed up slightly, then should be cooled off as rapidly as possible to a tem-

perature of about 60°, and the patient rubbed for a quarter of a minute and then taken out of the bath.

The same general rules are followed in the employment of the galvanic bath, except that the positive pole should be kept nearest the head. Great care must be exercised to avoid the use of too strong a current, and to avoid giving the patient a shock. A shock with the galvanic current might possibly produce disastrous effects.

With the galvanic bath, acid and alkaline substances are sometimes employed as a means of aiding electrolysis. The addition of carbonate or chloride of sodium, one or two pounds to the bath, increases the conductility of the water, and slightly modifies its effects.

Electro-Vapor Bath.— This is a combination of general faradization with the ordinary vapor bath. It may be administered by means of a faradic battery in connection with any one of the different methods of applying the vapor bath, in all of which it will be found usually effective. It is most conveniently applied in connection with a vapor box, or with a battery and apparatus constructed for the purpose.

Thermo-Electric Bath.—This bath is a combination of faradic electricity with hot air. It may be administered by means of a faradic battery in connection with the ordinary hot-air bath, or by the application of general faradization during the exposure to hot air in the Turkish bath. The effects of electricity in combination with hot air are similar to those obtained by its use with the vapor bath.

Various Combinations of Electricity with Water.— Electricity may be combined with water in a variety of other ways. The electric pour is a very simple and efficient combination. It may be conveniently administered by connecting the negative pole with some part of the patient's body, as the feet, and the positive with a tin dipper.

Other Electrical Appliances.— It has been found that two metals of whatever character, as zinc and copper or silver, when placed in contact with the skin, generate a slight current of electricity on account of the action of the perspiration upon the zinc. The quantity of electricity produced in this manner, however, is exceedingly small, and, consequently, it is very doubtful whether such appliances can be made of any practical value in the treatment of disease. They are practically worthless.

Surgical Uses of Electricity.— Electricity has come to be considered as one of the most useful of surgical appliances. Through the well-known heating effects of electricity, parts may be almost as rapidly and as efficiently destroyed as by the knife, the operation being known as electro-cautery. We have frequently employed

this method in the removal of polypi, tumors, and other morbid growths which could not have been otherwise treated without great risk and even considerable danger to the patient. By means of electrolysis, or the decomposing power of electricity, nevi, aneurisms, cancers, and numerous other morbid growths and conditions, may be removed. Electrolysis furnishes the best known means of depilation, or removal of the hair, the method of which is fully described under the proper heading.

Through the influence of our friend, Professor Apostoli, of Paris, electricity has within the last ten years made rapid strides toward a state in which it may be employed with all the accuracy and precision of any medicinal agent; indeed, it is now possible, by the aid of the milliamperemeter, coulombmeter, and voltmeter, to make applications of electricity with the highest degree of precision and accuracy. The perfect control of this powerful agent thus secured, renders it possible to use it in much stronger doses, and it is now frequently employed as a substitute for surgical operations, as in checking the growth of fibroid tumors of the uterus, which are sometimes cured by it. It is especially effective as a means of checking the pain and hemorrhage which usually accompany these tumors. The writer has succeeded in curing a number of fibroid tumors by the use of a strong galvanic electrical current. The faradic current is, of course, of no great value in these cases.

MEDICAL GYMNASTICS, OR SWEDISH MOVEMENTS.

The value of exercises of various sorts as a remedial measure has for ages been recognized by both barbarous and civilized nations. The Chinese, one of the oldest nations on the globe, together with the inhabitants of India, have long appreciated the value of exercise. According to accounts which have been gathered from their writings, they have for the last two thousand years or more possessed a knowledge of the remedial value of exercise, and have employed it frequently in a more or less systematic manner. The ancient Greeks and Romans also employed exercises of various sorts, not only for developing the body, but for relieving many diseased conditions.

We might find it interesting to note more particularly some of the peculiar modes of treatment employed by the various nations mentioned in ancient and modern times; but as our space is limited, we will confine our remarks entirely to what are known at the present time as "Swedish Movements."

THE REMEDIAL VALUE OF MOVEMENTS.

The value of movements in the treatment of disease has become now so thoroughly established that it is not necessary for us to adduce other arguments than the results of their use to show their utility. For some years after the introduction of this mode of treatment, it was looked upon with suspicion by the better class of physicians generally, and was left to be employed by quacks and charlatans. In many instances it has been employed by unscrupulous persons who sought to attract patronage by laying claim to the possession of skillful magnetic powers. There have been many cases in which patients were benefited by the treatment of these quacks, when in fact their success was wholly due to the results of the manipulations of various sorts which were invariably employed by the so-called "magnetic doctors." We will now briefly consider some of the principal remedial effects of the employment of medical gymnastics.

1. To Regulate the Circulation.—It has long been recognized as an established physiological fact that the circulation of the blood is greatly influenced by the action of the muscles. By muscular action the blood is pressed along the veins, and thus its progress toward the heart is greatly accelerated. Whenever there is a deficiency of muscular activity, as in persons who are confined to their beds or who are unable to take a sufficient amount of daily exercise, the employment of Swedish movements will often produce most marvelous results in restoring to a normal condition the unbalanced circulation. They are of special service as a derivative measure when applied to the hands and feet of any person suffering with habitual coldness of these members. We are acquainted with no remedy which will so readily secure marked and permanent results in this direction as this. Applied to the whole skin, it is an excellent means of relieving congestion of the head, spine, liver, and other organs.

2. To Increase Secretion and Excretion.—Movements are of very great service in cases in which there is very great diminution of secretion and excretion. They are especially useful in cases of torpidity of the liver and inactivity of the skin.

3. To Increase Respiratory Power.—No function may be so rapidly augmented and permanently increased by the aid of movements as that of respiration. We have known patients to double their

breathing capacity by a few weeks' practice in the employment of lung gymnastics.

4. To Increase Digestive Power.—In the great majority of chronic diseases of other organs, as well as in functional derangement of the stomach, deficient muscular power and activity of the stomach and intestinal canal is one of the principal morbid conditions, and one to which especial attention must be given in directing a successful mode of treatment. In many cases, movements applied to the abdomen seem to meet these indications better than any other remedy which can be employed. We have been in the habit of prescribing this means of treatment in cases of this sort for a number of years, and are more and more thoroughly satisfied with the results obtained.

5. To Increase Assimilation.—In not a small proportion of cases of chronic disease which come under the care of a physician, defective assimilation is one of the most serious obstacles which must be overcome in conducting the case toward a successful issue. It is not what a person eats, or even what he digests, that benefits him, but what he assimilates. There is no means by which assimilation may be so powerfully stimulated and encouraged as by the careful and skillful employment of Swedish movements. This fact is now so thoroughly recognized by the leading physicians of all countries that this means of treatment is relied upon as almost the sole remedy in the treatment of a large class of cases.

6. To Increase Vital Action.—The influence of movements in increasing vital action is shown not only by the rapidity with which patients gain in flesh under their employment, but by the fact that the immediate effect of the application in the majority of cases is to produce marked rises of temperature which cannot be accounted for in any other way but that there has been a marked increase in vital action as a result of treatment. As the effect clearly suggests, the remedy is of great service in the treatment of cases of general debility and all other diseases in which there is general inactivity of the vital functions.

7. To Regulate Muscular Action.—No remedy is of greater value in the treatment of that class of cases in which there is disordered muscular activity, as in various distortions of the spine, which result from unequal muscular action, in the great majority of cases of displacement of the womb, and various other diseases peculiar to women.

In cases of paralysis no other remedy, unless it be electricity, will accomplish so much as this; and if we were obliged to dispense with the use of one of these two remedies, we should certainly choose this as the one of greatest value.

General Principles Governing the Application of Movements.—In the application of medical gymnastics it is important to give attention to the following points:—

1. The kind of movements to be taken should be carefully and accurately adapted to the condition of the patient.

2. If the movements to be taken are of such a character that the patient can administer them to himself, he should receive careful instruction, as everything depends upon the proper application of the means employed; if they be given by another person, the attendant should be thoroughly trained, as much more harm than good will be done by an unskillful application of the remedy.

3. Movements are best administered at about ten o'clock in the forenoon, or between three and four o'clock in the afternoon, unless there is some special reason why they should be administered at some other time, as in cases of slow digestion.

4. At the beginning of a course of treatment with movements, the first application should be gentle, so as to avoid the production of muscular soreness and nervous irritability, which will often appear when this precaution is disregarded. In case, however, the patient suffers with a slight soreness, or with an increase of nervous irritability, and other slightly unpleasant symptoms, his fears should be at once quieted by the assurance that both these symptoms will disappear in a few days, as they will be almost certain to do.

5. In the application of movements, care should always be taken not to extend them sufficiently long to induce great fatigue. The patient should always be made to take an hour or two of rest after the application.

Description of Various Movements.—The various movements employed are divided into three general classes: Active, Passive, and Half-Active or Active-Passive. In the first class of movements the exercise is obtained wholly from the individual effort of the patient; in the second, the exercise is applied by means of an attendant; in the third class there is a combination of the two, attendant and patient coöperating, the two acting either alternately or at the same time,

each gently resisting the other's efforts. In institutions in which this remedy is relied upon almost entirely it is common to give a great variety of movements of various sorts. We will not attempt to describe the whole list, but will give a brief description of a few of those which we have found the most useful, and which can be the most readily utilized.

Movements to Develop the Muscles of the Trunk.—Figs. 232–245 represent movements which are especially designed to develop the muscles of the back, chest, and abdomen.

Fig. 232 represents an exercise to be taken in a doorway, or between two posts of proper height. The position is sufficiently well shown in the cut. The exercise consists in raising one foot and placing it forward as in walking, at the same time throwing the body forward with energy. The forward motion being arrested suddenly by the arms, a strong strain is brought upon the muscles of the front of the body, particularly those of the chest. After the forward movement, the foot is returned to its place beside the other. This movement is repeated eight or ten times with each foot. As in all other movements, the action should be deliberate, and energy and considerable muscular strength should be employed. This is a most excellent means for strengthening the chest.

Fig. 232.

Fig. 233.

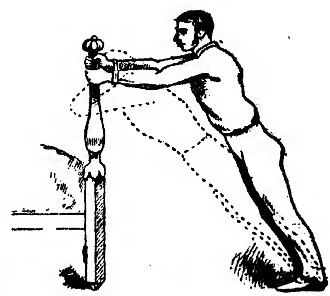


Fig. 234.

Fig. 233. Another admirable movement for developing the chest and the muscles of the trunk. The feet are thrown apart to brace the body, the hands being clasped over the head, and the trunk is oscillated from

side to side several times in succession ; then the same movement is executed from before backward.

Fig. 234. The weight of the body is partly sustained by the hands holding the top of a bed-post, or a ring fastened in a wall or post. The movement consists in swinging the body, making the points of support of the hands and feet the centers of motion. The movement may be varied by allowing the body to fall slowly toward the hands by bending the arms at the elbows, and then straightening the arms to restore the body to the first position again. The effect is to expand the chest and strengthen the muscles of the abdomen and back.

Fig. 235. The body is placed in the kneeling posture, with a cushion under the knees, and the heels prevented from rising when the body

Fig. 235.

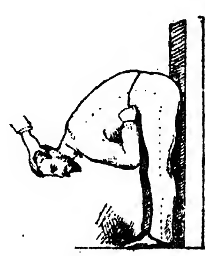


Fig. 236.

Fig. 237.

bends forward, as shown by the dotted line, by being placed under the edge of a sofa or some other convenient object. This movement affects not only the trunk but also the muscles of the calf and thigh.

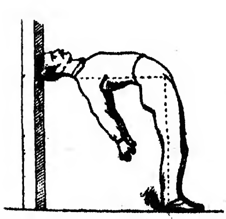


Fig. 238.

Fig. 236. The patient stands against a wall or post, and bends forward as far as possible without bending the knees. By the aid of an assistant, the head may be readily lowered to a level with the knees.

Fig. 237. In this movement the patient's head is thrown back as far as possible, and to prevent the patient from falling backward, the head is supported by the wall or a post.

Fig. 238 represents essentially the same movement, its effect being intensified by bending the body backward nearly to a right angle. In tak-

ing this movement it is necessary to have the back supported by the hand of an assistant.

Fig. 239. A movement calculated to increase the strength of the muscles of the back. The trunk is kept perfectly rigid, while the body is maintained in position for a few seconds, or until the muscles begin to show signs of fatigue.

Fig. 239.

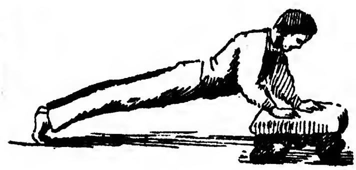


Fig. 240.

Fig. 240. The body is supported by the toes, which rest upon the floor, and the hands are placed upon a stool or platform raised about a foot higher than the floor. The effect of the movement is to increase the volume of the chest by throwing it forward.

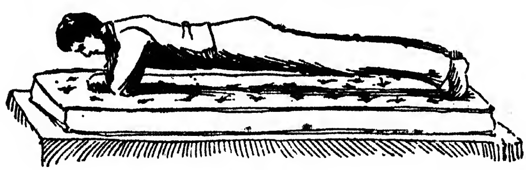


Fig. 241.

Fig. 242.

Fig. 241. This movement is somewhat similar to the preceding, but its action is different, the tension being brought chiefly upon the abdominal muscles. Excellent effects are obtained by its use in cases of prolapsus of the pelvic organs, rectum, etc. The body should be brought slowly into position, being retained in position for a moment and allowed to fall again. After resting a minute or two the movement should be repeated, until the body has been elevated five or ten times.

Fig. 242. In this movement the body is wholly supported by the head and heels, which rest upon platforms raised a few inches from the floor. This movement calls into vigorous action all the muscles of the neck, trunk, and legs. A little assistance will at first be required by

the patient in getting into position. The position should be maintained for a few seconds, and then the body may be let down to the floor to rest. After three or four minutes the movement may be repeated. The number of repetitions must depend, of course, entirely

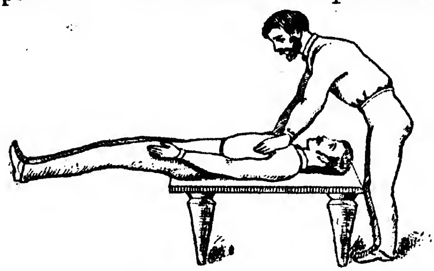


Fig. 243.

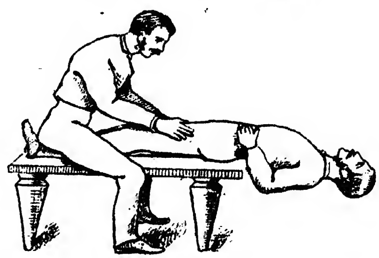


Fig. 244.

upon the strength of the patient. Care should be used not to strain the muscles too violently, which may easily be done in taking this movement, especially by beginners.

Fig. 243. The trunk is supported upon a platform in such a way that the lower end of the spine just reaches to the end of the supporting surface. The limbs are held rigidly in the position

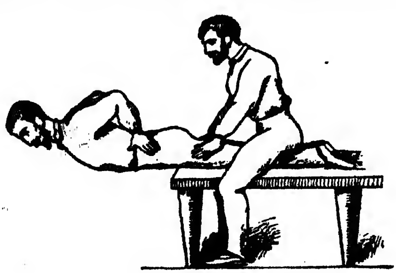


Fig. 245.

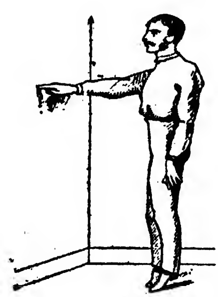


Fig. 246.

seen in the cut. This is a powerful means of exercising the muscles of the abdomen and thighs.

Fig. 244. In this movement the position is reversed, the legs being supported and held in position upon a platform by an attendant while the trunk is sustained in the air by the muscles of the abdomen and thighs. This movement should be used cautiously at first by those who are unaccustomed to such exercise.

Fig. 245. This is a modification of the preceding, in which the

trunk is sustained with the face downward. In this movement the principal strain is upon the muscles of the back instead of the abdomen.

Miscellaneous Movements.—Fig. 246, which represents toe-standing, requires no explanation. It is an excellent means of increasing circulation in the lower extremities. The body should be slowly elevated into the position shown, the patient rising as high as possible upon the toes while slightly supporting the body by the finger placed

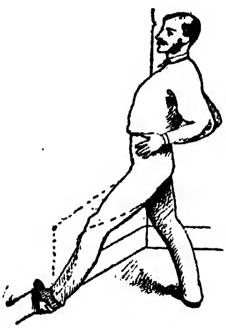


Fig. 247.

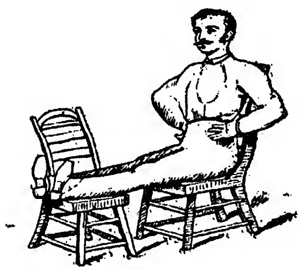


Fig. 248.

Fig. 249.

against the wall or a post. The elevated position should be maintained as long as possible, and the body slowly lowered to its natural position. The movement, in order to be effective, must be executed very slowly, so as to give time for the desired changes in the blood-vessels.

Fig. 247 represents an excellent exercise for the feet. The position of the feet is well shown in the cut. The exercise is produced by bending the knee and throwing the weight upon the forward limb. This movement should also be executed slowly, being repeated ten to twelve times with each foot.

Fig. 248 represents a light form of exercise consisting of rotation of the limbs. The limbs may be twisted together, both in the same direction, or in alternate directions.

A very great variety of other movements of a similar character might be given, but many of these are included under the head of "Gymnastic Exercises," and hence will not be described here.

Passive and Active-Passive Movements.—This class of movements requires the assistance of a skilled attendant. Many of them

may be learned by almost any intelligent person, however, and their great utility warrants a brief description in this connection.

Figs. 249 and 250 represent exercise of the arm, flexion and extension. These movements, like most other passive movements, are appli-

Fig. 250.

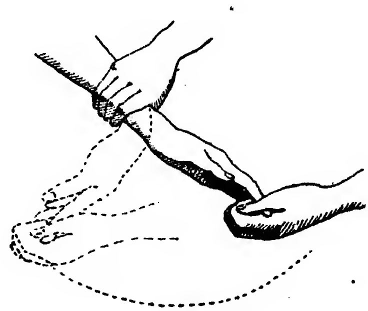


Fig. 251.

cable to persons who are either too weak to take active exercise or are suffering from paralysis which renders them incapable of doing so. It is a most useful exercise in cases of rigidity of the joints as the result of fractures, sprains, or other accidents which require long inactivity.

Fig. 252.

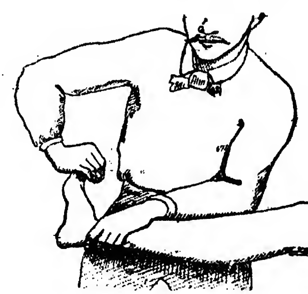


Fig. 253.

It should be employed in all such cases; and neglect of this important measure in cases requiring it has not infrequently resulted in irreparable injury to the affected joints.

Fig. 251 illustrates flexion and extension of the hand at the wrist; to be used in the same cases as the preceding.

Fig. 252 indicates the same kind of exercise applied to the lower extremities.

Figs. 253 and 254 represent an attendant in the act of flexing and extending the foot of a paralytic patient.

Fig. 255 shows the method of rotating the hand at the wrist, a means of treatment often found useful in cases in which there is deficient mobility of the joint.

Fig. 256 illustrates the same movement applied to the foot.

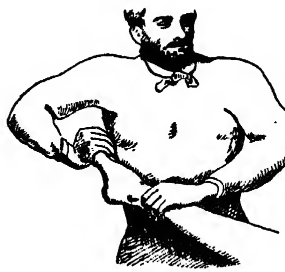


Fig. 254.

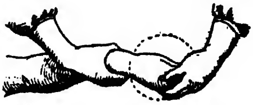


Fig. 255.

Fig. 257 shows the position of the lower limbs and the hands of the attendant in applying the rotary movement to the hip-joint.

Fulling Movement.—Fig. 258 illustrates a form of passive movement which has been appropriately designated as the "fulling" movement. The cut represents the movement as applied to the arm. It is

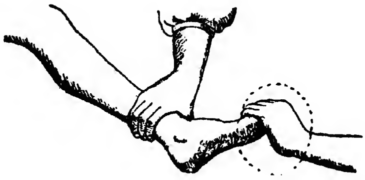


Fig. 256.

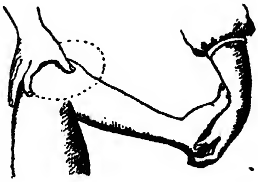


Fig 257.

applied to the head, neck, trunk, and lower limbs in a similar manner. It is an excellent means for encouraging assimilation and relieving internal congestion by increasing the circulation of the blood in the surface of the body.

Kneading.—Fig. 259 illustrates a method of kneading the muscles of the arm. The muscles of the arm are grasped at its upper extrem-

ity by the thumb and finger, being rubbed to and fro between them as the hand passes along the arm. In a similar manner the whole body may be kneaded. Kneading of the bowels applied in a manner similar to that in which a baker kneads bread, employing either one or both hands, is a most excellent means of relieving slow digestion and chronic constipation.

Stroking.—Fig. 260 illustrates a movement known as stroking. The hands are applied to the part of the body to which the movement

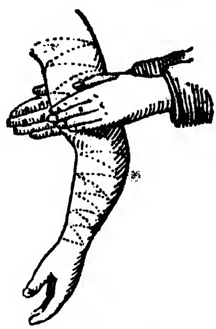


Fig. 258.

Fig. 259.

Fig. 260.

is being applied, and are moved slowly from above downward at first, and then afterward in an opposite direction, in such a manner as to follow the course of the veins and thus encourage the venous circulation. The application may be a very gentle one, soothing in character, or may be sufficiently vigorous to secure a considerable degree of exercise. Applied to the head and spine, stroking is a very excellent sedative, often securing sleep in persons who are unable to sleep on account of nervousness. Stroking the abdomen is an excellent means of increasing the activity of the bowels, and should be made to follow the course of the colon, so as to encourage the downward passage of the contents of the bowels. The hands should be applied low down on the right side and pressed upward to the ribs, across to the opposite side, and then downward to a point opposite the place of starting. Either one or both hands may be applied, and the movement may be made as gentle or as vigorous as the condition of the patient or the effect desired may require. At the outset of treatment it will often be found that great tenderness is present, so that the most gentle ma-

nipulation must be employed; but an experienced manipulator will at first avoid the tender points, gradually encroaching upon them more and more, until finally as great a degree of vigor may be employed as is desired.

Clapping.—Fig. 261. This movement consists in alternate percussion of the surface with the palms of the hands. It is one of the most generally applicable of all the forms of movement, being usefully applied after nearly all forms of water bath. Whenever it is necessary

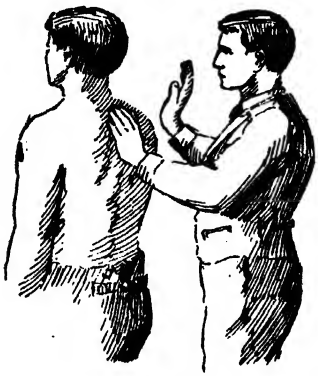


Fig. 261.

Fig. 262.

to excite activity of the surface, it is an admirable measure. Its effect is evidenced by the red color of the skin which almost invariably follows its application.

Chopping.—Fig. 262. This movement is similar to the preceding, the only difference being that the edge of the hand, instead of the palm, is used in application. In both chopping and clapping it is important that the movement of the hand should be wholly from the wrist, which should be kept perfectly flexible. When the wrists are rigid, the movement being made from the elbows, the effect produced is unpleasant, the patient feeling as though he were being pounded. In chopping, the blow should be quick and sharp, though little force should be employed.

The surface should be struck with the fingers, which should be kept a little way apart, and held loosely, so that they will clap together with each stroke. The object of the movement is to secure by quick, short blows rapid contraction of the muscles. It is a most excellent means of passive exercise, and a most efficient promoter of assimilation. Chop-

ping may be applied to the whole body. It should be executed systematically.

Knocking.—This movement consists in gently striking some part of the body with the clenched hand, the force of the blow being received upon the palm of the hand. Fig. 263 shows a form of this movement

Fig. 263.

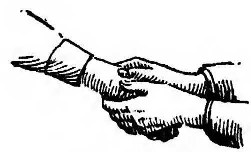


Fig. 265.

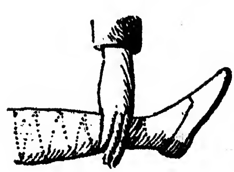


Fig. 264.

Fig. 266.

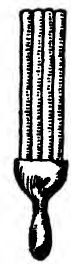


Fig. 267.

which is known as "chine knocking." The patient supports himself with one hand against the wall, and, leaning forward, strikes upon the lower part of the back with the other hand twenty or thirty smart blows. This movement is very effective in removing the dull, aching pain often felt in this region, and exciting activity of the lower bowels.

Sawing.—Fig. 264 illustrates this simple movement, which may sometimes be employed with advantage. Its effects are similar to those of stroking, though it is a somewhat more vigorous movement.

Vibration.—Fig. 265 illustrates the manner of vibrating the arm. The assistant takes the patient's arm, holds it out straight, and vibrates it as rapidly as possible for fully a minute. After a minute's rest the same is repeated, until the vibration has been performed eight or ten times. The lower extremities are vibrated in a similar manner.

The vibration of the chest, abdomen, and other parts of the trunk, is performed by placing the palm of the hand upon the part to be exercised, and by a rapid quivering movement of the muscles of the arm producing the desired effect.

Percussion.—Fig. 266. This exercise consists in striking the sole of the foot, protected by a shoe or boot, with a flat-sided ferule or wooden rod for the purpose. This is an excellent means for warming cold feet, and has been recommended for chilblains.

Fig. 268.

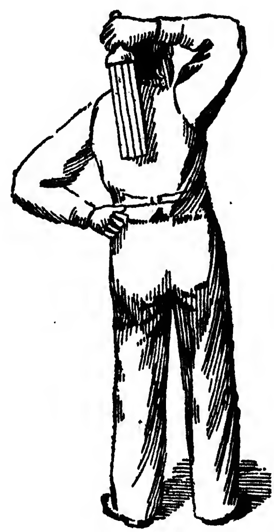


Fig. 269.

Massage.—This mode of treatment, which is at the present time becoming quite popular, especially in the treatment of cases of nervous debility, anemia, etc., is really nothing more nor less than a combination of a number of the above-described forms of treatment. Treatment generally begins with the feet. The first movement applied is fulling of the skin of the part manipulated, which is followed by kneading. One part of the body after another is manipulated, until the treatment has been applied to the whole body, especial attention being given to the bowels and loins. Vibration, chopping, and strik-

ing are next applied, the treatment concluding with stroking of the head and spine. In many cases in which this treatment is indicated, there is great tenderness of the spine or intercostal spaces, as in cases of spinal irritation, nervousness, etc. The attendant must take care not to exaggerate the suffering of the patient by rude handling of these parts, but by encroaching gently upon them from day to day, gradually accustom them to touch and manipulation, until finally, in

Fig. 270.

Fig. 271.

the great majority of cases, the tenderness may be made to wholly disappear. We have often observed cases in which a sensation of acute pain was produced by a very gentle touch, while firm and hard pressure gave no uneasiness whatever. For the class of cases mentioned, together with the majority of cases of chronic dyspepsia accompanied with great debility, consumption, uterine disorders, and, in fact, all diseases characterized by debility, massage is a most valuable mode of treatment. When the skin is dry and rough, and, in fact, in nearly all cases in which massage is indicated, the benefits of treatment will be greatly increased by the employment in connection with it of light inunction with refined cocoa-nut oil. Canton oil is the best

of any sort we have used. The only objection to it is its tendency to become rancid. This difficulty can only be corrected by keeping it in a cool place and covered with lime-water.

Muscle-Beating.—This is a method of treatment closely allied to Swedish Movements which has been recently approved and recommended by C. Klemm, a German physician of eminence. The instrument employed is represented in Fig. 267. It consists of three rubber tubes, together with a handle to which they are fastened. Beaters of various sizes are employed to suit the various portions of the body to be treated. Figs. 268 to 272 illustrate the various modes of using this form of exercise. In the figures referred to, the patient is represented as administering treatment to himself. In the majority of cases, however, it is better that the remedy should be applied by an attendant. The only advantage which this method of treatment has over those described is that it is so simple that it can be applied by almost any one, and hence requires less skill for its administration, so that it may be applied by the patient himself.

Fig. 272.

Lung Gymnastics.—No part of the body is more susceptible of development by judicious and appropriate exercise than the lungs. The amount of air which passes to and fro in the respiratory process is ordinarily but about two-thirds of a pint; and in cases of disease is much less, often being reduced to less than a third of this amount. By the daily exercise of the lungs in such a manner as to develop the chest, the breathing capacity may be very greatly increased. We have frequently seen the chest expanded three or four inches by a course of appropriate training. One of the best exercises for this purpose is forced respiration, which consists in breathing as deeply as possible, making strong efforts to fill the lungs, and emptying them as completely as possible. This exercise should be taken slowly from five to thirty minutes at a time, and should be repeated several times a day.

The accompanying cut (Fig. 272½) represents a very convenient breathing tube devised by the author as an excellent aid in lung gymnastics. The air being drawn in through the nose, is forced out through the tube, which is provided with a means of regulating the amount of resistance according to the patient's condition or the effect desired.

Fig. 272½.

MENTAL THERAPEUTICS.

Whatever may be the ultimate relation of the mind to the body, its influence over the latter for good or evil, in disease as well as in health, is certainly too great to be ignored in the consideration of the various agents by which the human system may be affected. Indeed, under some circumstances, the influence of the mind upon the body surpasses that of all other agencies that are or can be brought to bear upon it. Without delaying to furnish evidence for the influence of the mind upon the body in health, as this fact is so well and generally recognized, we will call especial attention to the effect of the mind in producing disease and also as an agent in the successful treatment of various diseases. Medical literature furnishes us with almost innumerable instances in which grave disorders as well as trivial affections have been cured through the influence of the emotions.

Numerous cases have occurred in which apoplexy has resulted from a sudden fit of anger or fear as also from intense pleasurable emotions, as a transition from a state of despair or grief to that of joy. It is stated that the man who invented the means for applying steam in navigation died suddenly of apoplexy upon learning that his invention had received favorable notice from a scientific committee to which it had been submitted. A mother fell in an apoplectic seizure upon meeting her daughter, for whom she was waiting at a railroad depot, but who she had reason to fear had been killed in an accident which had just occurred. History informs us that an ancient Grecian died of excessive joy from receiving his three sons returning crowned as victors in the Olympic games.

Insanity has not infrequently resulted from intense mental emotion, both pleasurable and the opposite. It is, however, well recognized that fear, grief, and other depressing agents are far more apt to produce serious results than are those of a pleasurable character.

It may not seem so remarkable that diseases of the nervous system

should be produced in this manner, but instances are not wanting to show that mental influence may produce disease of almost every function throughout the body.

The phenomenon known as bloody sweating, which has by many been considered impossible, has been observed in several instances, in which the exciting cause was extreme rage or fear. For example, the case is reported of a sailor who was so affected by fright during a storm which threatened destruction to the ship and all on board, that he fell speechless on the deck, and broke out into a profuse perspiration of blood. When wiped away from his forehead it appeared again, oozing out from the skin like ordinary perspiration. Microscopical examination of the sweat in other cases has shown that it does not contain blood corpuscles but only the coloring matter of the blood. It seems that this phenomenon occurs also in animals. A case is related of a hippopotamus, which, under confinement, manifested for hours the most intense rage. The whole skin became covered with a bloody perspiration. In this case a microscopical examination showed that blood corpuscles had actually exuded from the skin.

Several cases are recorded in which jaundice has been produced by rage and fear. Medical students sometimes become very yellow in consequence of mental anxiety which they undergo in the suspense preceding examination when failure is feared.

The effect of fear in causing cholera during an epidemic of this disease is so well known that it scarcely requires mention. Instances of the sort have been so numerous that there can be no doubt that during cholera times many persons have died of symptoms exactly resembling those of the disease, of which fear was the only cause.

A case is recorded in which small-pox, or a case exactly resembling it, seems to have been produced by the same mental influence. It is stated that a woman who was begging, with her child, in an English city, stopped a carriage containing two ladies, requesting alms, which being refused, she threw her child into the carriage declaring that it had the small-pox and would communicate it to the inmates, upon whom she showered the most horrible imprecations. There was no evidence that could be obtained that the child was suffering with disease of any sort, yet one of the ladies was taken with small-pox within twenty-four hours, and died.

Chorea, or St. Vitus dance, hysteria, and other convulsive and hysterical diseases, are frequently produced from the influence of the imagi-

nation, often as the effect of example. This fact has been observed in a number of instances in which diseases of this sort have actually become epidemic wholly through imitation. The effect of grief and disappointment in producing serious organic diseases, as consumption, is a fact too well known to need confirmation by examples. Every one is familiar with cases in which persons suffering some kind of disappointment, or great bereavement, have gone into a decline, and died in a few months in spite of all that could be done for them. Both rheumatism and gout have been produced by mental influence, either through severe fright, the agony of suspense, or from fixing the mind on a part of the body, as in the case of John Hunter, who is said to have produced gout in his great toe by a prolonged effort of the will.

We might multiply to any extent instances in which diseases have been produced by the influence of the mind upon the body, but we will now call attention to some of the morbid conditions, of the cure of which through mental influence alone there have been well-authenticated instances. Everybody is familiar with the fact that toothache frequently disappears as the sufferer from this painful affection approaches the dentist's office. Numerous instances have occurred in which persons have visited the office of a dentist for the purpose of procuring an extraction, but have found themselves so wholly free from pain when they reached the office door that they returned home without suffering the loss of the offending member. Many years ago an Italian physician was very successful in treating toothache by having the patient rub an insect between the fingers and apply them to the aching tooth. He claimed to cure at least three-fourths of his patients by this means, in which the imagination was the only active agent. Cases of painful joints in which patients have suffered, sometimes for many weeks, months, or even years, with gout or rheumatism, or purely hysterical affections, have not infrequently been cured by the operation of some strong mental influence, as sudden fright from the burning of a house, the sudden approach of a mad-dog, or from some other cause.

The case is related of a patient who, while suffering from an attack of colic, received a prescription, with instructions to "take it." He obeyed the order literally, taking the paper prescription instead of the compound, the making of which it directed. The medicine had such a magical effect that in a few hours he was entirely cured. It is said that the physicians in Tartary very frequently treat their patients in this way, writing the name of the medicine on a piece of paper, rolling it

into a ball, and allowing the patient to swallow it whenever the drug which they desire to administer is not at hand. An English physician relates a case in which a lady patient of his, suffering with pain in the chest, or pleurodynia, was promptly relieved in a somewhat similar manner. He wrote a prescription for a plaster, and handed it to her, giving directions to wear it, meaning, of course, the plaster. She, supposing that the paper prescription was the remedy intended to be worn, placed it over the painful part, with the effect of producing prompt relief.

Hysteria and other convulsive diseases, and even epilepsy, have been cured by severe fright, intense grief, and by affecting the imagination. The French committee appointed to investigate the claims of Mesmer, the first magnetic doctor, when he was exhibiting in Paris in the latter part of the last century, stated in their report that in their experiments they had succeeded both in causing and curing convulsive affections through the influence of the imagination.

Almost every one is familiar with anecdotes concerning persons who have for years been bed-ridden with paralysis or other diseases, rendering them unable to walk, who have been suddenly cured by severe fright, as from a sudden fire or other danger. Sir Humphrey Davy had a case of paralysis which was entirely cured by the application of a thermometer to the patient's mouth. In taking the temperature of the patient prior to an administration of nitrous-oxide gas, he observed that the patient seemed to experience beneficial results. Indeed, the patient was quite enthusiastic over the effects of the new remedy, which was applied daily without the use of any other means, with the result of wholly curing the patient in a week, although he had been for some time affected with the disease.

Herodotus tells the story of the sudden cure of a dumb person in the presence of great danger. He states that "during the storming of Sardis, a Persian, meeting Crœsus, was, through ignorance of his person, about to kill him. The king, overwhelmed by this calamity, took no care to avoid the blow, or escape death; but his dumb son, when he saw the violent designs of the Persian, overcome with astonishment and terror, exclaimed aloud, 'O man, do not kill Crœsus!'" It is stated that the cure thus effected was permanent.

Probably the most familiar and indeed one of the most remarkable, of all illustrations of the influence of the mind in effecting a cure of disease, is seen in the familiar method of removing warts by charms of

various sorts. Plenty of instances might be cited in which persons having warts which had existed for years and had been treated by more tangible means without success, have had them quickly removed by the application of some such remedy as rubbing with a split bean, doing the bean up in paper, and leaving it out in the road for some one to pick up; or rubbing them with a piece of fresh meat stolen from the butcher-shop, and then throwing the meat away to decay, the wart being supposed to disappear with the decay of the meat. It is impossible to believe that in these cases the remedies employed can have any curative effect whatever. Whatever influence they may have must be attributed wholly to the imagination of the person employing them. That warts are often cured in this way, however, there can be no doubt, as hundreds of the most intelligent people are ready to testify. An interesting illustration of the effect of the imagination in curing disease, occurred in the siege of Beda in 1625, when large numbers of the soldiers were suffering extremely with the scurvy. The Prince of Orange announced that he would provide an invaluable remedy. Each physician was supplied with two or three small vials of balsam, a drop or two of which was stated to be sufficient to impart powerful medicinal properties to clear water. With this diluted medicine the soldiers were treated, and with a success which was most extraordinary, and which was wholly due, of course, to its effect on the imagination.

Gout has been promptly cured by fear. Abernethy says on this point in his lectures, " You may see a person with gout that is almost unable to move with pain; but produce a shock to the nervous system by telling him that the house is on fire and he will scamper about like a lamp-lighter."

Ague has in innumerable instances been cured through the operation of the imagination of the patient. In this disease, as we shall elsewhere show, all that is necessary for a cure is to interrupt the regular paroxysms of the disease. We have known instances in which persons were cured by such novel remedies as going down stairs headforemost on all-fours, and other procedures incapable of producing any other than a mental effect. Without doubt, a large share of the results obtained in the use of quack remedies arise from the faith of the patient in the remedy employed. There are numerous illustrations of the employment with great success of remedies which are inert or nearly so, and which attain great celebrity until their inert properties

are discovered. Remedies of this sort are well represented by Holman's Liver Pad, Galvanic Belts, the much lauded waters of many mineral springs, etc. The cures effected by "magnetic doctors" offer plenty of illustrations of the power of the mind—that of the patient, not of the doctor—over the body. As we have elsewhere shown, there is no probability whatever of the existence of any occult force which can be communicated from one person to another, as is claimed by believers in animal magnetism. All the results which have ever been obtained by this mode of treating disease may be fairly attributed to the influence of the will and the imagination of the patient himself. The effects obtained from the so-called "magnetic rubbing" must be attributed, in part at least, to the effects of rubbing, independent of the patient's imagination. We have elsewhere in this work (see page 149) called attention to a series of observations which we made some years ago on the effect of the mind upon the body in the cure of diseases. We have since observed many more striking instances in which equally appreciable results have been obtained in the same way.

IMPORTANCE OF EMPLOYING MENTAL THERAPEUTICS.

We believe that mental therapeutics is a perfectly legitimate agent for use in the treatment of disease, and there is no reason why intelligent physicians should not employ it in the treatment of many disorders, at least those of a functional character. Every observing physician is aware of the different results which occur according as the patient's mental condition is cheerful or depressed. It is the common experience of all physicians to see patients decline and die under the influence of maladies which might and should have been relieved by the remedial agents employed, but the beneficial effects of which were counteracted by the unhappy mental state of the patient. If the patient's mind can be brought into full harmony with the method of treatment employed and his faith and confidence fully secured, his chances for recovery from any malady are increased tenfold. Many times have we seen patients to whom we could give no encouragement and whose recovery seemed to be wholly impossible, gradually improve under simple methods of treatment, and finally recover, as we firmly believe, more through the influence of their own hope and determination to recover than through any remedial agent applied. On the other hand, we have with equal frequency seen patients whose dis-

orders were not of a serious character and who had sufficient natural vigor and sufficiently favorable conditions to secure recovery, apparently, at least, but who went down into the grave, as we have every reason to believe, simply because of a lack of force of character or of strength of will to bring the mind to co-operate with the treatment employed or to preserve such a mental state as would be conducive to recovery. Every physician, and, in fact, every person who has anything to do with the sick, should realize the importance of imparting courage, good cheer, and hope to them, as by that means they may in many cases do more than in any other way to secure their recovery. There are, no doubt, cases in which it is allowable for the physician to bring to bear such means as fear and other powerful mental agents in the treatment. These cases must be rare, and such means when resorted to should be used with the greatest caution, like doses of powerful poison. A mental remedy which may be used, however, with much success in many cases is the directing of the patient's attention to the part under treatment, at the same time inspiring the most perfect confidence that the cure will certainly be effected. It has been shown by numerous experiments that concentrating the attention upon any part induces changes in its circulation and nervous supply, and that attention can thus be used as a means of curing the disease. In using it as a curative measure it is of course essential, as before remarked, that the patient should be thoroughly convinced that the result desired will certainly be secured by the means employed. In a large share of cases, at least, the expected result will be obtained, although the remedy employed may be wholly inert. The remarkable effects often obtained by the use of highly potentized remedies must be attributed to this cause.

In conclusion, we again urge that physicians pay more attention to the employment of mental therapeutics. We do not doubt that if remedies were more often applied to the mind and much less to the stomach, the practice of medicine would be attended with much more successful results.

MEDICAL DIETETICS.

We have already called attention, in considering the hygiene of food, to the important relations of food to the maintenance of health and the prevention of disease, but another phase of the subject of dietetics of almost equal importance still remains for consideration;

namely, the relation of food to the system in a state of disease. It has long been known that the use of various articles of food produces different effects upon the system in disease from their use in health, many food substances which are taken apparently without detriment in health becoming causes of serious difficulty when taken while the system is suffering with disease. In consequence of this fact, intelligent physicians in all ages have taken care to interdict special articles of food in certain diseases, in which they had been found to produce a pernicious effect. It has also been observed that certain articles of food when received into the system while it is suffering under the morbid influence of special diseases, seem to exercise a favorable influence upon the progress of the disease, hastening recovery or mitigating symptoms, if not exerting a still more powerful remedial influence on the disease. This has given rise to what has been termed the "diet cure," sometimes also called the "nutritive cure," different phases of which are known as the "milk cure," the "whey cure," the "buttermilk cure," the "grape cure," the "starvation cure," and similar terms. While it is not probable that in any of the so-called diet-cures the article of food upon which chief reliance is placed fills so important a part by any means in the cure of the disease to which it is said to be adapted as has been supposed, it is nevertheless probable that in most cases, at least, the use of the particular article recommended is to secure more favorable conditions for the curative operations of the vital force than might otherwise have existed. This may be attributed either to the superior virtues of the food employed, or, as is in most cases undoubtedly true, to the absence of articles of a damaging character. The object of this section is to call attention to the relations of articles of food to diseased conditions, pointing out particularly the morbid conditions and diseases in which some particular articles of food are inadmissible, and also the conditions in which the same articles are specially indicated. First, we will notice—

Meat, or Flesh-Food.—As has been shown elsewhere, meat in the condition in which it is almost always eaten contains a large proportion of excrementitious or waste products, which exist in the tissues of animals at the moment of death. These substances are ordinarily eliminated from the system with sufficient readiness to prevent any immediate serious effects; but when the system is laboring under disease, the ability to dispose of this surplus of waste and poisonous matter is so greatly lessened that much harm may result from its use.

This is especially true in cases in which the liver and kidneys,—two of the most important eliminative organs,—are affected, as in Bright's disease, acute albuminuria, scarlatina, diphtheria, incontinence of urine, inflammation of the liver, gall-stones, and diabetes insipidis; and in general diseases, accompanied by fever of any degree of intensity, as typhoid fever, scarlatina, diphtheria, malarial fevers, measles, small-pox, and other febrile diseases, including acute and chronic rheumatism, gout, pleurisy, pneumonia, and pericarditis; together with diarrhea, dysentery, and the other bowel-diseases incident to warm weather, including cholera; various forms of nervous disease, particularly those which occur in sedentary people, insomnia, or sleeplessness, some forms of neuralgia, chorea, epilepsy, and some disorders of the stomach, as in chronic gastritis, weak digestion, accompanied with tenderness at the pit of the stomach, and that form of dyspepsia usually termed biliousness, or bilious attacks. Persons who have suffered from apoplexy, especially when the attack has been recent, and those suffering with valvular disease of the heart, require an unstimulating diet, and hence the less animal food taken the better, although it need not be wholly interdicted, except in recent cases of apoplexy. Both of these diseases require that the amount of animal food used should be exceedingly limited.

In the treatment of drunkenness, it is important to bear in mind that the stimulating influence of meat has the effect to excite the desire for alcohol, and hence its use should be very limited, if allowed at all. Mr. Napier, of England, has recently shown that one of the best means of destroying the appetite is to cause the drunkard to abstain from the use of flesh-food; and our own experience in the treatment of inebriates has abundantly confirmed the same observations.

Children often suffer much with nervousness and other obscure troubles which may be directly traced to the use of flesh-food. When allowed at all, it should never be taken until the teeth are sufficiently well developed to allow of its thorough mastication.

In nearly all of the diseases mentioned in the preceding paragraphs it is of the greatest importance that the use of meat should be interdicted, at least while the patient is under treatment and for a sufficient length of time after the cure has been effected to preclude the possibility of its having any influence to cause a recurrence of the disorder. In many cases this would require abstinence from meat for a long time, and in a majority of cases this would be found beneficial

rather than otherwise. It has been frequently observed that patients who have been cured of rheumatism while abstaining from the use of animal food have an almost immediate relapse, with swelling of the joints, and high fever, upon resuming the use of animal food. Relapses of typhoid fever are often similarly caused by the use of meat before the stomach has acquired power to digest it. Inflammation of the stomach is often produced in fever-patients during convalescence by the use of meat. It should be recollected that in withdrawing meat a sufficient quantity of some other form of nitrogenous food should be supplied. Oatmeal and wheat-meal furnish the required elements in a form in which they can be easily assimilated, and never produce any of the serious results which follow the use of meat, in the diseases and conditions named. In most cases, also, milk and eggs may be used to a considerable extent, especially the first-mentioned article, either by itself or in combination with such farinaceous foods as oatmeal gruel, barley gruel, rice, and farina.

Milk may often be used with very great benefit, sometimes as an almost exclusive article of diet for a short time, in cases of great debility, anemia, farinaceous or flatulent dyspepsia, and acid dyspepsia. The special reason for its use in debility is, that, on account of the readiness with which it is digested, the nitrogenous tissues which are suffering for need of repair may be more rapidly built up than by vegetable food; the system also requires a larger proportion of nitrogenous elements than is found in a natural state. If in any of these cases, however, the use of milk is contra-indicated on account of other conditions, its place may be supplied by such food as gluten, kumyzoon or buttermilk, granose, and preparations of peas, beans, lentils, especially in the form of purées, nuts, or better, nut-meal. Gluten is particularly useful in the forms of dyspepsia mentioned, on account of its being digested in the stomach and not undergoing fermentation, and thus giving rise to acidity. It is quite the custom nowadays to use meat in these cases in a raw state, a practice of which we cannot approve, however, as it exposes the patient to the liability of contracting diseases more serious than those he possesses. Reference has already been made to the fact recently demonstrated by Dr. Leidy, of Philadelphia, that tapeworm in America is most frequently derived from beef which has been eaten in a raw or slightly cooked state. In any case in which it seems necessary to administer meat in a raw condition, it should be inspected with the greatest care to insure its absolute freedom from parasitical

infection. If small white specks are observed, it should be at once discarded. It is, however, often difficult to detect the embryos of the tape-worm in beef by the unaided eye, and hence absolute safety would require the inspection of every portion of the meat with the microscope.

Fats.—These are of all articles the most difficult to digest. A piece of fat pork will remain in the stomach five or six times as long as a ripe apple, and two or three times as long as a portion of rice or well-cooked grain. When fats are added to food in cooking, it becomes much more difficult of digestion. Fried food, pie-crust, and similar articles are absolutely indigestible by a weak stomach. Fat also interferes with the digestion of other food, as we have previously shown, and also diminishes the secretion of bile by producing an inactive and congested state of the liver. On this account, fat meats and the different fats should be wholly interdicted in most cases of dyspepsia, torpid condition of the liver, gall-stones, jaundice, and in that somewhat indefinable but very common condition known as biliousness. For all these reasons, they should be forbidden in obesity also.

Fat in the form of cream, and such nuts as almonds, chestnuts, and filberts, may be used freely with benefit by very thin people whose digestion is not greatly impaired, and especially in the emaciation incident to consumption, diabetes, and other wasting diseases. In many of these cases, the use of a small quantity of cream in connection with other food seems to have a favorable influence upon nutrition by increasing the assimilation. Nut-meal (Sanitarium Health Food Co., Battle Creek, Mich.) is also valuable.

Milk.—Milk is one of the few articles of food which contains all the elements of nutrition in a form easily digested and assimilated; hence it is rarely to be forbidden altogether. However, there are many persons whose experience seems to show that it has a clogging effect upon the liver, at least in particular cases, occasioning headache, "biliousness," and other unpleasant symptoms. Such, of course, should avoid its use. There are also certain classes of dyspepsia, such as acid and bilious dyspepsia, which do not tolerate the use of milk. Many persons will find, however, that they are able to use milk without any inconvenience, if it is taken in the proper manner, being eaten rather than drank, and taken in limited quantities. Such persons should avoid the use of sugar and fruits, especially acid fruits, in conjunction with milk. Milk must be forbidden in cases of gall-stones and jaundice.

Milk is sometimes found almost indispensable as an article of food in

the treatment of fevers, especially in the cases of children, in the treatment of certain classes of nervous disease, particularly those dependent on defective nutrition and accompanied with impaired digestion. The free use of milk in some cases as an almost exclusive article of diet, has been found to be very advantageous. We have frequently succeeded in curing cases of this sort by a milk diet in conjunction with other hygienic measures, after all other known remedies had failed. The use of skim-milk is an excellent means of combating obesity.

Vegetables.—Vegetables are objectionable in some diseases and morbid conditions, first, on account of the large amount of woody matter which they contain, which renders them difficult of digestion and liable to produce irritation of the membranes in different parts of the alimentary canal; second, on account of the large proportion of starch which most of them contain in the form which is more difficult of digestion than the starch grains, and is hence more liable to undergo fermentation, developing injurious acids and troublesome gases. The diseases and morbid conditions in which vegetables should be wholly interdicted, or restricted to a very small amount, are as follows:—

Painful and flatulent dyspepsia, also in many cases of acid dyspepsia, gastric ulcer, cancer of the stomach, dilatation of the stomach, and painful hiccough. Vegetables containing a large proportion of starch must also be interdicted in diabetes. Bright's disease requires that the patient should abstain from the use of asparagus, turnips, cabbage, carrots, beans, peas, and all other vegetables which contain a large amount of woody fibre. In very obstinate and long-standing torpidity of the liver it is wise for the patient to refrain for some time from the use of coarse and starchy vegetables as potatoes, also from grains composed chiefly of starch, as rice and starchy preparations, such as sago, farina, etc.

In a large share of the diseased conditions of the stomach it is necessary for the patient to abstain from the use of vegetables in conjunction with fruits or meats. They may be taken alone or with grains when they may not be tolerated with other kinds of food.

Tomatoes, ordinarily wholesome, are thought to be injurious in diabetes insipidis, and asparagus is by many physicians interdicted in rheumatism; asparagus and beans are also to be abstained from in this disease when they produce pain in the region of the kidneys with deposit in the urine.

The free use of vegetables is especially indicated in constipation of the bowels, in scurvy, and in many cases in which patients have for a long time been deprived of them.

Grains.—Grains when properly prepared are almost always well received by the system in disease as well as in health. About the only condition in which they may not be taken is diabetes mellitus in which they are objectionable on account of the large proportion of starch which they contain. Even in this disease, however, grains deprived of their starchy constituents are among the most essential articles of food. There are also conditions of the digestive organs which do not admit of any but the finer portions of the grains, as in painful dyspepsia and gastric ulcer. It is also of the greatest importance in these cases that food should be very thoroughly cooked.

The free use of grains is especially indicated in neurasthenia, nervous debility, anemia, consumption, and constipation. The object of their use in these cases is twofold: first, to supply an abundance of nitrogenous elements and nutritive salts in a condition in which they can be easily assimilated, as in consumption and all diseases characterized by exhaustion of the nervous system; second, to supply the necessary degree of bulk in the digestive organs, and enable the stomach and bowels to perform their functions properly, as in constipation, a very frequent cause of which is the use of too concentrated food.

Fruits.—Fruits afford a very small proportion of nutriment, and yet are very useful in various diseased conditions as additions to other foods. About the only conditions in which their use must be interdicted are acid and flatulent dyspepsia, and sweet fruits in diabetes. Fruits, especially apples and lemons, are particularly useful as curatives of biliousness and constipation. The use of grapes in typhoid fever has been very highly extolled; to such an extent, in fact, that in some places this disease has been treated by what was termed the grape cure, which consists in confining the patient almost exclusively to the use of grapes. Grapes have also been used in relieving other diseases. The idea that fruit should not be used in bowel diseases is an unfortunate error, as many people have been led to abstain from the use of this wholesome article of food in cholera times, and during the "heated term," when bowel diseases are most common.. There is plenty of evidence to show any one that good ripe fruit is one of the most efficacious preventives of bowel diseases of all kinds, and that the use of such fruits as grapes, without the seeds, ripe apples, and the other better kinds of fruit, is of value as a means of curing some forms of bowel trouble. Many fruits, particularly apples, and those fruits containing a considerable proportion of water, seem to increase the activity of the kidneys, and hence are useful when those organs are functionally inactive.

Sugar.—There are no conditions of the system for which sugar is to be especially recommended, since it is always eaten in abundance in the form of starch, which, it is well known, is wholly converted into sugar in the system, and in case of an insufficient supply from other sources, the liver will rapidly produce it, even from the nitrogenous constituents of the food. There are, however, numerous conditions in which its use is very injurious and should be wholly interdicted. Some of the more important of these are diabetes, gall-stones, acid and flatulent dyspepsia, and also inactivity of the liver, and that very common morbid condition known as biliousness.

Salt.—As previously pointed out, the dietetic value of salt is by no means so thoroughly established, as many seem to suppose. Whatever may be its relation to the system in health, there is the best of evidence to show that in some diseases, at least, its use should be restricted as much as possible, and in some cases discontinued altogether. This is particularly true of gout and inflammation of the kidneys. Persons who are liable to attacks of gout, often find themselves entirely free from their painful enemy when abstaining wholly from salt, but suffer a relapse immediately when chloride of sodium or any other of the sodium salts is taken into the system. Very little salt should be taken in fevers; the former custom was to interdict its use altogether. It is probable, however, that with persons accustomed to its use, a small quantity may be advantageous in preventing the appetite from failing altogether, especially when the fever is prolonged. It is evident, however, that when the eliminative organs are so greatly overtaxed as they always are during a febrile attack, very little of this or of any other element which will increase their labor should be taken. To restrict the use of salt is almost as useful in rheumatism as in gout. In diabetes, when the tendency of the patient is always to drink more water than is best for him, and when the blood is already rendered too thick or of too high specific gravity by the excessive quantities of sugar in it, a limited use of salt is evidently indicated.

Condiments.—After what has been said of the use of condiments in health, we need scarcely add that their use should be wholly interdicted in disease. They are responsible for a large number of diseases, and there is no diseased condition which is not increased by their employment.

Drinks.—The regular amount of fluid received into the system is a very important matter in many diseases. In some forms of dyspepsia the use of dry food and almost total abstinence from drinks, especially near the time of meals, is absolutely essential to recovery. This is emphatically true of the particular kind of dyspepsia in which, on account of the inactivity of the absorbent vessels of the stomach and intestines, fluids are taken up slowly and remain for a long time near the alimentary canal. This condition has sometimes been called the "indigestibility of fluids." We have also confirmed an observation made by an eminent English physician, that in many cases of organic disease of the heart, fluids are tolerated only in very small quantities at a time, and scarcely at all in connection with food. This is due also to the inactivity of the absorbents, which results from the congestion of the vessels of the stomach due to the mechanical obstruction of the circulation in the heart. It should also be remarked that in cases of dilatation of the stomach the less fluid taken with the food the better, as there is such an inactive state of the absorbent vessels of the mucous membrane of the stomach in this condition that fluids are retained a long time.

With these few exceptions, drinks may be properly used with great advantage in nearly all diseases, particularly in those which require increased elimination; hence they are especially indicated in all types and varieties of fevers, in cases of defective nutrition, in inflammation of the liver, inactivity of the liver, biliousness, acute and chronic diseases of the kidneys, constipation of the bowels, inactivity of the skin, rheumatism, gout, and cholera. In the latter disease the copious drinking of cold water has been found to be one of the most efficacious of all known remedies, as the absorbents of the intestinal tract in this disease will scarcely act at all. Fluids taken pass rapidly through the stomach and intestinal tract, thus washing out the bowels, carrying away the poisonous elements of disease, and aiding nature in her efforts to effect a cure. The restriction of drink is a common practice in both forms of diabetes, and is frequently carried to too great an extreme. A demand for fluids is as much an expression of want on the part of the system as want felt in any other condition, and hence it should be regarded and acceded to, at least in sufficient degree to prevent the patient from too great suffering.

Abstinence from Food.—All physicians recognize the fact that in many diseases, especially those of an acute character accompanied with fever, the use of food should be restricted to a considerable degree. By entire abstinence from food for one or two days, together with active

eliminative treatment, many febrile diseases may be checked at the outset. In bowel diseases caused by taking indigestible food, total abstinence from food for a day or two, or the use of a very small quantity of light food once or twice a day, is particularly advantageous. Attacks of asthma when occurring in persons addicted to high living may often be promptly cut short by prohibiting any but the very lightest articles of food for a day or two. In pericarditis and inflammation of the lining membrane of the heart, or endocarditis, a very restricted diet should be employed, especially in those who have previously been overfed.

Digestibility of Foods.—For the benefit of persons whose digestive organs are weak, or who desire to preserve them in health by avoiding articles of food which are difficult of digestion, we have prepared the following tables, which are based upon careful observation and the experiments of Beaumont upon the stomach of Alexis St. Martin.

Articles Easy of Digestion.—The following articles are readily digested by a healthy stomach, and can be digested with comparative ease by most dyspeptics (see also diet tables in the Appendix):—

ANIMAL FOODS.

Raw white of egg, beaten to a froth.
Beef tea, free from fat.
Raw whole egg, beaten.
Milk, fresh and warm.
Fresh eggs, soft boiled.
Mutton, broiled.
Venison steak, broiled.
Chicken, especially the white parts.
Rabbit.
Fresh trout, and most fresh fish which are not oily.

VEGETABLE FOODS.

Stale bread.
Graham rolls, made without yeast or soda.
Rice, well boiled or steamed.
Tapioca, sago, corn-starch.
Oatmeal porridge, eaten with dry toast.
Graham mush or crushed wheat.
Cauliflower,
Asparagus, if very tender.
French beans.
Baked sweet or subacid apples.
Strawberries and whortleberries.
Grapes, without skins or seeds.
Oranges and bananas.

Articles Not Easy of Digestion.—The following list includes the common articles of food which require a considerable degree of vigor on the part of the digestive organs, and must be avoided by all bad dyspeptics:—

ANIMAL FOODS.

Animal soups of all sorts.
Beef.
Lamb.
Turkey, duck, pigeon.
Codfish.
Oysters, raw.
Butter.
All sorts of roast meats.

VEGETABLE FOODS.

Potatoes.
Turnips.
Cabbage.
Tomatoes.
Peas.
Beans.
Raisins and most dried fruits.
Apples.
Peaches.
Plums.
Cherries.
Pineapples.
Beets.
Carrots.
Spinach.
Parsnips.
Vegetable soups.
Corn-meal preparations.
Salads of all sorts.
Currants.
Gooseberries.
Raspberries.
Blackberries.
Rhubarb.
Jelly.

Indigestible Articles.—The following articles, while they may be digested by a vigorous stomach, impair the digestive powers and induce indigestion, and to the dyspeptic are more of the character of poisons than of foods :—

ANIMAL FOODS.

Pork.
Veal.
Goose.
Liver.
Kidney.
Heart.
Sausage.
Hard-boiled eggs.
Scrambled eggs.
Cheese.
Hashed and stewed meats.
Salt and smoked meats.
Melted butter, and all animal fats.
Mackerel, and all oily fish.
Salt fish.
Dried and smoked fish.
Sardines, and other fish preserved in oil.
Lobster, crabs, etc.
Cooked oysters and clams.
Fried meats of all sorts.

VEGETABLE FOODS.

Warm bread, especially when taken with butter.
Muffins.
Buttered toast.
Pies, cakes, and all sorts of pastry.
Pancakes.
Fried bread and vegetables.
Nuts of all kinds.
Onions.
Mushrooms.
Pickles.
Tea, coffee, cocoa, chocolate.
Mustard, pepper, spices, and other condiments.
Sugar, preserves, and all saccharine foods.

Nutritive Injections.—In certain diseases of the stomach, as in gastric ulcer, inflammation of the stomach, chronic gastritis, enlargement of

the stomach, and the vomiting of pregnancy, it is often necessary to allow the stomach to rest for days, and in some cases even for weeks, no food being taken in the usual way. In these cases it is of the greatest importance that the proper nutritive injections, or enemata, should be employed. The idea that soups, beef tea, milk, or other undigested food, may be digested in the rectum and absorbed, thus nourishing the system, is without foundation. But, as elsewhere remarked, recent discoveries have given grounds for the supposition that food injected into the rectum is carried up into the small intestine, where it may undergo digestion in the regular way. When possible, however, on account of the weakened condition of the digestion and the possibility that the undigested food may not be carried into the small intestine, the food should be artificially digested, at least in part, or should be so prepared that it will undergo digestion after introduction into the bowels. There are several methods of preparing food for this purpose, all of which are highly recommended. The value of suitable preparations for use as a nutritive enemata we have frequently and thoroughly proven by experience in the treatment of cases in which they were required, having kept patients for weeks on little else than the nutritive enemata. We are acquainted with cases in which life has been well sustained for several months in this way. (See Appendix.)

USEFUL DIETETIC RECIPES.

Milk and Lime-Water.—In many cases in which milk is indicated as an important article of diet, indeed, as the most important of all foods, as in young infants, it cannot be taken without distress on account of the large, tough curds which it forms in the stomach. For cases of this sort, ordinary cow's milk may be mixed with lime-water in the proportion of a large teaspoonful of lime-water to a tumblerful of milk. If the difficulty still continues, the lime-water may be used in the proportion of one part to two of milk. Barley-water will in most cases answer as well as lime-water.

Bran Tea.—Soak a teacupful of bran in cold water over night in a cool place. Simmer for half an hour, and strain through a cloth. A soothing drink, said to encourage activity of the bowels. We have not much confidence in its laxative properties. It is a good lotion for irritated surfaces.

Acorn Coffee.—Select plump, round acorns. Shell, and brown in an oven. Grind in a coffee-mill, and use as ordinary coffee. A good drink for children suffering with diarrhea, on account of the tannin which it contains. It is also recommended for scrofulous persons.

Water Gruel.—Over a dessert-spoonful of finely ground oatmeal, mixed with a tablespoonful of cold water, pour a pint of boiling water; let it settle two or three minutes, then pour off the water carefully, leaving the coarser part of the meal. Boil ten or fifteen minutes, stirring frequently.

Milk Gruel.—Into a pint of scalding milk stir two tablespoonfuls of fine oatmeal. Add a pint of boiling water and boil until the meal is thoroughly cooked.

Oatmeal Gruel.—Stir two tablespoonfuls of coarse oatmeal into a quart of boiling water, and let it simmer at least two hours. Strain if preferred.

Rice Gruel.—Soak two tablespoonfuls of fine rice for half an hour in cold water. Pour off the water; add a pint of milk and let it simmer until the rice is tender. Press through a sieve and then dilute with milk. Heat again for a few moments; pour off to cool, and flavor with a little salt or sugar.

Milk Porridge.—Place over the fire equal parts of milk and water. Just before it boils, add a small quantity (a tablespoonful to a pint of water) of graham flour or corn meal, previously mixed with water, and boil a minute longer.

Rice and Apple.—Stew two or three large, ripe apples to a pulp and sweeten with a little white sugar. Then boil a half teacupful of rice in milk until it is quite tender. Put the rice round a plate with the apples in the center and serve. A dish which most invalids, unless bad dyspeptics, will readily digest. Excellent for fever convalescents.

Rice Blanc-Mange.—Heat one quart of milk to near boiling; then stir into it one-fourth of a pound of finely ground rice previously mixed to a smooth batter with a little milk. Add two spoonfuls of white sugar and let it boil until thick enough to mold, stirring it all the time. Flavor, while boiling, with a little lemon or pine-apple. Serve cold.

Arrow-Root Blanc-Mange.— Bring a pint of milk to boiling point,

add a batter made by mixing two tablespoonfuls of arrow-root with a little milk, and let it boil. Sweeten and flavor to the taste, stirring assiduously until it thickens sufficiently to mold. Corn-starch blanc-mange may be made by this same recipe by using the above proportion of corn-starch instead of arrow-root.

Egg-Nog.—Beat one egg and a teaspoonful of refined sugar to a stiff froth; add a teaspoonful of lemon-juice; pour in a glass, and fill up with water.

White of Egg and Milk.—The white of an egg beaten to a stiff froth and stirred very quickly into a glass of milk is a very nourishing food for persons whose digestion is weak, also for children who cannot digest clear milk. The white of egg has a tendency to prevent the formation of hard curds in the stomach.

White of Egg.—Stir the white of an egg into a tumblerful of cool water, or water warm as it can be without coagulating the egg. Give to infants suffering from extreme disorder of digestion and unable to take milk. This simple mixture has saved many an infant's life.

Beef Tea.—For every quart of beef tea desired, use one pound of fresh beef from which all fat, bones, and sinews, have been carefully removed. Cut the beef into pieces a quarter of an inch square, or grind in a sausage-grinder, and soak over night in a small quantity of water (a pint will do). Take the beef out and let it simmer gently in a larger quantity of water for two or three hours, replacing from time to time the water lost by evaporation. Afterward pour together the boiling liquor and the cold liquid in which the beef was soaked.

Beef tea is not a food; it is practically a solution of ptomaines,—the poisonous products of tissue waste. Its value has been enormously overestimated. The late Dr. Austin Flint remarked that many invalids had been starved to death on beef tea. Vegetable broths are in every way preferable. Avoid beef tea, especially in fevers and kidney diseases.

Flaxseed Tea.—Take an ounce of whole flaxseed, half an ounce of crushed licorice root, an ounce of refined sugar, and four tablespoonfuls of lemon juice. Pour over these ingredients a quart of boiling water; let this stand near the fire for four hours, and then strain off the liquid. The flaxseed should not be crushed, as the mucilage is in the outer part of the kernel and if bruised the boiling water will ex-

tract the oil of the seed and render the decoction nauseous. The tea should be made fresh daily.

Barley Water.—Take half a teacupful of good pearl barley. First wash it thoroughly; then boil five or ten minutes in fresh water. Drain off this water and pour on two quarts of boiling water and boil down to one quart. Flavor if desired with a little lemon or sugar. Thin to required consistency with boiling water.

Currant-Jelly Water.—A tablespoonful of currant jelly stirred into a glass of cold water makes a pleasant beverage for fever patients.

Apple Water.—Wipe two or three ripe, tart apples, and slice, without paring, into a dish and pour over them a quart of scalding water. Let stand until cool; then turn off water and sweeten.

Toast Water.—Brown a slice of stale bread or crust thoroughly, but do not allow it to blacken or burn. Break the toast into small pieces and put into an earthen dish or jug; pour over the pieces a quart of boiling water; cover the dish tightly, and let the mixture remain until cold. When strained it will be ready for use.

Lemonade.—Mix the slices and the juice of two lemons with three spoonfuls of refined sugar and add a pint of cold or iced water.

Hot Lemonade.—Take two thin slices and the juice of one lemon; mix with it two teaspoonfuls of white granulated sugar, and add one half pint of boiling water. A very useful drink for a person when exhausted. A splendid substitute for tea and coffee.

Sago Jelly.—Simmer gently in a pint of water two tablespoonfuls of sago until it thickens, frequently stirring. A little sugar may be added if desired.

Bread Jelly.—Pour boiling water over bread crumbs; place the mixture on the fire and let it boil till it is perfectly smooth. Take it off, and after pouring off the water, flavor with something agreeable, as a little raspberry or currant jelly water. Pour into a mold until required for use.

Tapioca Jelly.—Take two tablespoonfuls of tapioca and one pint of water; let it simmer until it becomes thick like jelly. A little lemon juice and sugar may be added.

Gum-Arabic Water.—Put an ounce of choice gum arabic into a jar with two ounces of refined sugar and a pint of water. Place the jar in a sauce-pan of warm water and stir until dissolved. Add a little lemon to flavor. This is a good drink for consumptives.

A superior quality of gluten biscuit is manufactured by the Sanitarium Health Food Co., Battle Creek, Mich., from a formula furnished by the author. They are found to be of great service in the treatment of diabetics.

Granola Mush.— Granola, a cooked preparation of wheat and oats, manufactured by the Sanitarium Health Food Co., makes a most appetizing and quickly prepared breakfast dish. Into a quart of boiling water sprinkle a pint of granola. Cook for two or three minutes, and serve hot with cream.

Bran Jelly.— Select some clean wheat bran, sprinkle it slowly into boiling water as for graham mush, stirring briskly meanwhile with a wooden spoon, until the whole is about the consistency of thick gruel. Cook slowly in a double boiler for two hours. Strain through a fine wire sieve placed over the top of a basin. When strained, reheat to boiling. Then stir into it a spoonful or so of sifted graham flour, rubbed smooth in a little cold water. Boil up once; turn into molds previously wet in cold water, and when cool, serve with fruit juice.

Browned Rice.— Spread a cupful of rice on a shallow baking tin, and put into a moderately hot oven to brown. It will need to be stirred frequently to prevent burning and to secure a uniformity of color. Each rice kernel, when sufficiently browned, should be of a yellowish brown, about the color of ripened wheat. Steam in a dish suitable for serving, over a kettle of boiling water, using two cups of water for each cup of browned rice. When properly cooked, each kernel will be separate, dry, and mealy. Rice prepared in this manner is undoubtedly more digestible than when cooked without browning.

Barley Gruel.— Wash three heaping teaspoonfuls of pearl barley, dropping it into a pint of boiling water, and parboil five minutes. Pour this water off and add a quart of fresh boiling water. Let it simmer gently for three hours. Strain, season, and serve. A small piece of lemon rind added to the gruel a half hour before it is done, gives it a very agreeable flavor. Equal quantities of milk and barley gruel make a very nourishing drink; the milk, however, should not be added to the gruel until needed, as in a warm atmosphere it undergoes quite rapid change, and is likely to ferment.

Gluten Gruel.— Stir two and one half tablespoonfuls of the wheat gluten prepared by the Sanitarium Health Food Co., Battle Creek, Mich., into a pint of boiling milk; boil until thickened, when it is ready to serve.

Gluten Gruel No. 2.— Into a pint of boiling water stir three heaping tablespoonfuls of prepared gluten. Boil until thickened, and add a half cup of thin cream.

Gluten Cream.— Heat a pint of thin cream to boiling, and stir into it three tablespoonfuls of wheat gluten. When thickened, it is ready to serve.

Gluten Meal Gruel.— Into a cup and a half of boiling water stir four tablespoonfuls of gluten meal (prepared by the Sanitarium Health Food Co.), let it boil for a moment, add six tablespoonfuls of rather thin sweet cream, and serve.

Graham Gruel.— Heat three cups of water in the inner dish of a double boiler, and when boiling vigorously, stir into it carefully, a little at a time, so as not to check the boiling, one scant cup of graham flour which has been rubbed perfectly smooth in a cup of warm, not hot, water. Stir until thickened, then

place in the outer boiler and cook for an hour or longer. When done, strain if necessary, season with salt if desired, and a half cup of sweet cream.

Graham Grits Gruel.— Cook three heaping tablespoonfuls of graham grits in a quart of boiling water, in a double boiler, for three hours. Turn through a soup strainer to remove any lumps, season and serve. Well-cooked graham grits may be made into gruel by thinning with water or milk, straining, and seasoning as above.

Indian Meal Gruel.— Make a thin paste of one teaspoonful of flour, two tablespoonfuls of best cornmeal, and a little water. Stir this into a quart of boiling water, or milk and water in equal proportions, as preferred. Boil until the meal has set, stirring constantly; then turn into a double boiler and cook for an hour and a half or two hours. Season with salt, and strain. If too thick, thin with a little additional liquid.

Milk Porridge.— Take one pint of milk and the same quantity of water, and heat to boiling. Stir in two heaping tablespoonfuls of cornmeal or graham grits, boil, stirring continuously, until the meal has set, then turn into a double boiler and cook for two hours longer. Season with salt, and a tablespoonful of sweet cream if allowed.

Oatmeal Gruel.— Into one quart of boiling water stir two heaping tablespoonfuls of fine oatmeal; let it boil until it thickens, stirring all the time; then turn into a double boiler and cook for three and a half or four hours. Strain before serving. A little cream may also be added, unless contra-indicated by the patient's condition.

Oatmeal Gruel No. 2.— Pound one half cup of coarse oatmeal until it is mealy. The easiest way to do this is to tie the oatmeal in a coarse cloth and pound it with a wooden mallet. Put it in a pint bowl, and fill the bowl with cold water. Stir briskly for a few moments until the water is white, then allow the meal to settle. Pour off the water, being careful to get none of the sediment. Fill the bowl a second time with cold water, stir thoroughly, let settle, and pour off the water as before. Do this the third time. Boil the liquid one half hour, strain and serve hot. If very thick, a little milk or cream may be added.

Peptonized Gluten Gruel.— Prepare the gruel as directed for Gluten Gruel No. 1. Strain if necessary, cool to lukewarm, and turn it into a pitcher, which place in a dish containing hot water even in depth with the gruel in the pitcher; add the peptonizing fluid or powder, stir well, and let it stand in the hot water bath for ten minutes. The temperature must not be allowed to rise over 130°. Put into a clean dish and serve at once, or place on ice till needed. Other well-cooked gruels may be peptonized in the same way.

Rice Water.— Wash half a cup of rice very thoroughly in several waters. Put it into a saucepan with three cups of cold water and boil for half an hour. Strain off the rice water, season with salt if desired, and serve.

Gluten Meal Custard.— Beat together thoroughly, one pint of rich milk, one egg, and four tablespoonfuls of gluten meal. Add a little salt if desired, and cook with the dish set in another containing boiling water, until the custard has set. Or, turn the custard into cups, which place in a dripping-pan partly filled with hot water, and cook in a moderate oven until the custard is set.

Gluten Custard.— Into a quart of boiling milk stir four tablespoonfuls of wheat gluten moistened with a little of the milk, which may be reserved for the purpose. Allow it to cook until thickened. Cool to lukewarm tempera-

ture, and add three well-beaten eggs, and a trifle of salt, if desired. Turn into cups, and steam over a kettle of boiling water until the custard is set.

Currantade.— Mash thoroughly a pint of ripe red currents, and one half the quantity of red raspberries; add sugar to sweeten and two quarts of cold water. Stir, strain, cool on ice, and serve.

Crust Coffee.— Brown slices of graham bread in a slow oven until very dark in color. Break in pieces and roll fine with a rolling pin. A quantity of this material may be prepared at one time and stored in glass fruit cans for use. When needed, pour a cupful of actively boiling water over a dessertspoonful of the prepared crumbs, let it steep for a few minutes, then strain and serve.

Egg Lemonade.— Beat the white of an egg to a stiff froth, then mix with it the juice of a small lemon, and one tablespoonful of sugar. Add a half pint of cold water. Or, beat together with an egg-beater a tablespoonful of lemon juice, a teaspoonful of sugar, the white of an egg, and a cup of cold water, until thoroughly mingled, then serve at once.

Hot Lemonade.— Put in a glass a thin slice of lemon and the juice of half a small lemon, being careful to remove all seeds; mix with it one dessertspoonful of white sugar, and fill the glass with boiling water. Or, remove the peel of the lemon in very thin parings, turn one pint of boiling water over them, letting it stand for a few moments covered. Remove the peel, add the juice of a lemon and one tablespoonful of sugar, and serve.

Orangeade.— Rub lightly two ounces of lump sugar on the rind of two nice fresh oranges, to extract the flavor; put this sugar into a pitcher, to which add the juice expressed from the oranges, and that from one lemon. Pour over all one pint of cold water, stir thoroughly, and serve.

Granose Shortcake.— Cover the bottom of a shallow pudding dish with a thin layer of granose flakes, add a layer of fresh strawberries, chopped and slightly sweetened, then a second layer of granose. Fill the dish thus with alternate layers of granose and berries. Set away in a cool place for an hour, when it will be ready to serve. The juice of the berries should permeate the entire mass, but should not render it too wet and soggy. Cut in squares. No dressing is required. Raspberries and other small fruits may be utilized in the same manner.

Boiled Peanuts.— Shell the nuts and blanch by pouring over them boiling water. After standing a few minutes, the skins can be easily rubbed off. Add to a pint of the blanched nuts about two quarts of water, put them into a bean pot; heat to boiling, then place in a slow oven and cook for nine or ten hours. When done, they should be soft, mealy, and rich with juice. No seasoning except a little salt will be required.

Vegetable Broth.— Put a cupful of well-washed white beans into a quart of cold water in a double boiler, and cook slowly until but a cupful of the liquor remains. Strain off the broth, add salt, and serve hot. If preferred, a few grains of powdered thyme may be added as flavoring.

MEDICINAL AGENTS AND MISCELLANEOUS REMEDIES.

Under this head we shall consider briefly the principal drugs employed in medicine, together with miscellaneous remedies not included under any of the preceding heads. We have purposely omitted giving the doses of the majority of medicinal agents mentioned, believing, as previously remarked, that the administration of drugs capable of producing injurious or poisonous effects should be discouraged, to accomplish which is, indeed, one of the objects of this work, for which reason we have devoted so much space to a consideration of hygienic or non-medicinal remedies. In a great majority of cases in which drugs may be usefully employed in the treatment of disease, the services of an intelligent physician are required, and the regulation of the doses may be properly left to him.

Tonics.—Tonics are drugs which are supposed to increase vital strength, and hence they are chiefly used in diseases and conditions characterized by debility. Numerous theories have been advanced to explain their supposed action, but none which seem to us more satisfactory or more capable of logical proof than that of Dr. Guy, of London, who asserts that their effects are produced in precisely the same manner in which the effects of stimulants are produced. As we have already seen, stimulants seem to produce an increase of strength simply by irritation, by means of which the forces of the system are developed really in antagonism to the influence of the drug, though sometimes incidentally to some useful purpose also. The effects occasioned by tonics are much less marked than those of stimulants, but it cannot be shown that they are in any way different except in degree. There are, doubtless, cases in which the use of tonics occasions more good than harm, yet we firmly believe that an immense amount of harm has been done by a false reliance upon tonics to accomplish what can only be effected through the medium of good food, pure air, sunshine, and obedience to all the laws of hygiene. We are also thoroughly convinced from observation and treatment of hundreds of cases of debility in all its various forms and stages, that far greater benefit is to be derived from the invigorating influence of such agents as sunshine, and an abundance of pure air, together with the proper application of *massage*, water, electricity, and other hygienic remedial agents, than from all the medicinal tonics that can be brought to bear in such cases.

We have, in fact, by these means restored to health many persons who had tried in vain the whole list of medicinal tonics afforded by what an eminent physician is pleased to call the "polypharmacy of the text-books."

The principal drugs employed for supposed tonic effects are classified as bitters, aromatics, and mineral tonics.

Some of the more commonly employed of the first class are *quassia, gentian, columbo, boneset, gold-thread, salicin, wild-cherry bark, cinchona, quinine,* and other preparations from *Peruvian bark, strychnia, chamomile,* and *Virginia snake root.*

The second class is chiefly composed of the various substances employed as condiments, including *cinnamon, cloves, allspice, black pepper, red pepper, cardamoms,* etc.

Under the head of mineral tonics are included all the different preparations of *iron, sulphuric acid, nitric acid, muriatic acid, nitro-muriatic acid, lactic acid,* and *phosphorus.*

Of the above-mentioned drugs we will notice but a very few. The whole class of bitters may be represented by the chief of them,—*quinine.* The rational view of their tonic effects we have already explained, but they possess another curious property to which we shall call attention; namely, the power to destroy the regularity of the paroxysms in periodic diseases, as ague and remittent fever, from which they are called antiperiodics. Quinine is about the only one, however, which is employed for antiperiodic purposes, as this property is too feeble in most of the other bitters to be of much practical account.

We do not wish to be understood as arguing against the use of quinine as an antiperiodic, as we believe it to be one of the most useful of all medicinal agents on account of its efficiency in interrupting the paroxysms of malarial disease. It is but fair to add, however, that the same result may be accomplished by numerous other agents, as well as quinine. We have cured many cases of malarial disease in which the symptoms were well marked, without the use of a single grain of quinine, or, in fact, of drugs of any kind. Directions for the use of quinine in malarial disorders will be given in connection with the treatment of those diseases.

Strychnia is looked upon as one of the most powerful of all the tonics employed in medicine. It is one of the most violent and certainly fatal poisons known. It has been much used in paralysis and some forms of dyspepsia, and in nervous debility. When administered even in very

minute doses it seems to call forth the most powerful resistance on the part of the system, causing, in any but the smallest doses, violent tetanic convulsions. No certain antidote for its effects is known, and severe cases of poisoning by it are almost certainly fatal.

Strychnia, like alcohol, increases the expenditure of energy, without increasing its production, but on the contrary, lessening these tissue-changes upon which the development of energy depends.

A careful study of the matter will convince any candid person that the only real difference between the drugs called stimulants and those called tonics, is, that the reaction following the excitation produced by those called tonics, is less immediate, and hence less apparent than in the case of those drugs which are termed stimulants. One reason for this, in the case of strychnia, is that the drug is slowly eliminated.

Mineral Tonics.—Of the mineral tonics, by far the most largely used is iron, of which a very large number of preparations are employed. As this is the chief of all the mineral tonics we will confine our observations to it alone.

Many years ago, Prof. Liebig, a noted German chemist, made a chemical analysis of the blood, and found iron in it. He claimed to prove by his experiments that the color of the red corpuscles of the blood was due to the presence in them of the oxide of iron, which was supposed to play a very important part in the transmission of oxygen from the lungs to the tissues, and the removal of carbon di-oxide (commonly called carbonic acid) from the system.

According to the Boston *Medical and Surgical Journal*, M. Dujardin-Beaumetz is not a believer in the therapeutical virtues of iron in anemia and chlorosis. Notwithstanding the existence of a lessened quantity of iron in the blood of anemic and chlorotic patients, he says that this diminution is of very little consequence, being ten to twenty centigrams, at the most, of the total amount of two grams of iron in five litres of the blood of an average-sized adult. Now, according to Boussingault, the daily food introduces into the body more than this quantity of iron; consequently, the loss of iron may be made up by the food alone.

Many physicians who have had a large experience in the treatment of anemia have become well convinced that iron alone is of very little value in the treatment of this disease. Blood is made from food, not from iron. If iron is lacking in the blood in cases of

anemia, it is not because the food is lacking in this constituent, in the majority of cases, but possibly because of the deficiency of red blood corpuscles, or of inability on the part of the system to manufacture red blood corpuscles of normal quality. In cases of anemia, also, the condition of the blood must be regarded as only one feature of the case. The blood is a tissue, and all the other tissues suffer as well as the blood; not simply because of the impoverished condition of the blood, but for the same reason that the blood suffers; namely, a lowered state of vital or nutritive activity on the part of the tissues. In the great majority of cases the primary fault is in the digestive apparatus. This is true even in cases in which the patient experiences no discomfort in the region of the stomach or other digestive organs. The remedy is to be found in improving the patient's conditions of life, rather than in dosing with medicinal agents of any sort. An abundance of easily digested food, out-of-door life, light gymnastics, breathing exercises, cold bathing, employment of the moist abdominal bandage worn at night, the abdominal supporter in cases of prolapse of the viscera, massage, and suitable applications of electricity,—these are measures which are of immensely greater value than any medicinal agent administered in any form.

It should be added, however, that recent investigations seem to show that in certain cases at least, iron is useful as an aid to digestion, particularly in cases of hypopepsia and apepsia; that is, cases in which there is great deficiency of hydrochloric acid in the gastric juice. It is possible that iron may so influence the glands of the stomach as to increase the amount of hydrochloric acid formed. This theory has been advanced by Hayem and Winter, two eminent physicians of Paris. We have made a considerable number of observations for the purpose of testing the theory, but thus far have seen nothing which could be said to definitely substantiate it. The proper treatment for anemia is fully discussed elsewhere in this work.

Heart Stimulants.—The drugs enumerated under this head are *ammonia* and its compounds, *alcohol* in all its forms, *turpentine*, and *digitalis*.

Ammonia, the first-mentioned of these is a colorless, irrespirable, highly irritant gas, of a strong alkaline reaction, and very soluble in water. *Aqua ammonia*, or *ammonia water*, is simply water which has been impregnated with ammonia gas. Applied to the skin,

ammonia is a powerful irritant; and when inhaled, causes irritation of the air-passages, and even inflammation. One of the most common uses of ammonia is to prevent syncope, or fainting.

Alcohol and its relations to the human organism in disease as well as in health, have been dwelt upon at so great length elsewhere that we need not give the subject extended notice here.

It should be said, however, that the popular notion that alcohol is in any way a supporter of vitality, a substitute for food, a tonic, a stimulant, a useful agent as a retarder of nutrition, have all been shown to be erroneous by the results of modern physiological research. Alcohol may be justly associated with the class of poisonous chemical substances called ptomaines, which result from the growth and activity of germs, and on this account could not be expected to be a supporter of vitality. It retards nutrition only by poisoning and paralyzing the tissues. Its general use as a supporter of vitality in severe cases of typhoid fever, in pneumonia, and in other exhaustive diseases, is doubtless responsible for a vast number of deaths. When the system is already struggling under the influence of a poison, the result of germ action, as is the case in the diseases mentioned, and in fact in nearly all cases of acute disease, what good can possibly be derived from the addition of another poison, which is also the result of the growth or activity of germs? Many physicians, among others Sir B. W. Richardson, of London, Professor N. S. Davis, M. D., of Chicago, and others equally notable, have renounced the use of alcohol as a remedy altogether, and contend that this drug can be dispensed with as a medicinal agent, not only without loss, but with great gain.

Hot and cold sponging of the spine, and especially hot sponging of the surface of the body, are more powerful means of producing a tonic effect on the heart, than is digitalis. Digitalis is a diuretic, and probably the most useful in this way, but copious water drinking is, in most cases, the best method of producing diuresis.

Heart Sedatives. — The principal drugs included in this class are *antimony* and its preparations, *arnica*, *veratrum viride*, *aconite*, *hydrocyanic acid*, *cyanide of potassium*, and *vegetable acids*. With the exception of the vegetable acids, all the drugs included in this list are powerful poisons. Their effects, whether administered in health or disease, are essentially those of poisoning, the principal effect being a great decrease in the activity of the heart's action,

The author finds no use for this class of drugs. When an ordinary sedative is needed, a tepid bath, followed by an ice-bag placed over the region of the heart, will accomplish all that is desired, and physiological remedies of this sort are easily controlled. The effects can be modified to a nicety, and their use does not incur the risk of injury there is in the employment of the powerful drugs mentioned.

Antimony, in the form of *tartar emetic*, is so named from the fact that its discoverer experimented with it as medicine upon several Spanish monks, who died from its effects. From this it was called *antimony*, which is derived from two Spanish words meaning "anti-monk." Three quarters of a grain in a child and two grains in an adult, in the form of tartar emetic, have produced death. In those cases in which antimony is supposed to be useful, copious water drinking, together with fomentations placed over the chest two or three times a day, and followed by a cool, moist pack, well covered, so as to produce vigorous reaction, is much more effective, and does not produce the exhausting effects of this drug.

Vegetable acids can hardly be considered as drugs, since when taken in their natural form, they are really foods, being taken and digested by the system. When taken in large doses, they sometimes produce symptoms resembling those of the other poisonous substances mentioned under this head, whence they have been put in this class.

Citric acid in the form of lemon juice is a very valuable agent in the treatment of several diseases. Its value in scurvy has long been known, and is now so well recognized that whaling ships and other vessels going on long voyages always take a supply of preserved lemon juice as a preventive of scurvy. Lemonade is also a very valuable drink in fevers, on account of its cooling properties. The free use of lemons in malarial fevers sometimes appears to have a decided influence in cutting short the disease.

Arnica, another member of this class of drugs, has been much used as a liniment in bruises and wounds of various kinds. Frequently, however, it has been observed that decided effects of poisoning have followed its use in this way, and many physicians have recently abandoned its use on this account.

Prussic acid, like arnica and antimony, is a powerful poison. Indeed, it is without doubt the most rapidly fatal drug in use. It is

never kept in a pure state, as its vapor alone is sufficiently poisonous to produce fatal effects.

Antispasmodics.—This class includes *musk, castor, valerian, assafetida, camphor, hops, lactucarium, coffee,* etc.

These drugs are called antispasmodics because used in those conditions of the nervous system included under the head of nervousness, together with exaggerated forms of the same conditions, such as hysteria and various other convulsive disorders. How the effects of these drugs in relieving nervousness and interrupting convulsions are produced, our works on materia medica and therapeutics do not explain. There can be no doubt, however, that their apparent action, as is the case with other drugs, is wholly due to the reaction of the various parts of the system against them as foreign elements in the vital domain. Several members of this class are violent poisons. *Assafetida,* a drug very frequently used for the relief of hysteria and nervousness, is in some Eastern countries used in very small quantities as a condiment. It has a very offensive taste and odor, and it is exceedingly strange that it should ever have acquired a use of this sort.

The medicinal properties of *hops* are due to a substance which they contain called *lupulin.* People frequently find their insomnia relieved by the use of hop pillows. The soothing effect of a hop poultice when applied to painful parts is well known. It is, perhaps, one of the mildest narcotics which is used in this way. The poultice may be made by simply pouring hot water on the hops contained in a gauze bag of the right size and shape, which is applied to the painful part, or by mixing the hops with Indian meal and making a poultice with hot water.

Lactucarium is a medicinal substance obtained from lettuce. It is said to have narcotic effects, but these are so slight that even the most concentrated preparation has been taken in very large quantity without producing any effect whatever. It is probable that it may have some slight effects.

Coffee is still classed among other drugs as a medicine. It properly belongs with medicinal agents, and is, consequently, wholly unfit for daily use as an article of diet. Ordinary *tea, Paraguay tea,* and all other substances which contain caffeine, possess essentially the same properties as coffee. Strong coffee has been found to be a valuable means of counteracting the effects of poisoning by opium. This is

about the only good thing we can say of this almost universally abused drug.

Anodynes.—This term is applied to drugs which are used for the relief of pain. We shall mention under this head only *opium, morphia, Indian hemp, belladonna,* and *hyoscyamus.*

These drugs are all characterized by their power to relieve pain, an effect which is due to their benumbing influence upon the brain, the seat of sensibility. They are more largely used, perhaps, than any other class of drugs employed in medicine. This is especially true of opium, the chief of all agents for the relief of neuralgia and many other painful affections.

Morphia has a still more powerful effect than opium, being a concentrated extract from the crude drug. While these agents are of the greatest service in affording relief from pain and suffering which is beyond the hope of cure or cannot be reached, they are abused to an extent which is fearful to contemplate. Sufficient has perhaps been said with reference to the employment of opium in the opium habit, and we shall not repeat our previous observations on this subject. We will, however, simply revert to the fact that it is the medicinal use of the drug which in the majority of cases leads to its habitual employment. We cannot but regard the reckless manner in which opium and other anodynes are used by many, perhaps the larger share of physicians, as in the highest degree worthy of condemnation. Physicians often forget that the relief of the prominent symptoms of a case is but a small part of the work which must be done if a cure is to be effected. The relief of symptoms we regard, indeed, as but a small part of the physician's duty. His first work should be to find out the cause of the suffering, and then he should set to work to remove this cause at the earliest possible moment. If it can be quickly removed, no other means for removing the pain need be employed, as the removal of the cause will itself bring relief. If, however, the cause is found to be of such a nature that it cannot be removed at once, but considerable time must elapse before relief can be obtained in this way, it is often the duty of the physician to employ such other means as may be necessary to mitigate the sufferings of his patient sufficiently to secure for him the greatest degree of comfort compatible with his best interests. By the employment of ingenuity and the proper degree of painstaking it will be found possible in a very large proportion of cases in which opium and other anodynes are commonly

employed, to obtain relief without resorting to remedies of this class, and we regard it as the solemn duty of every physician to give such remedies only in cases of actual necessity. All physicians who have observed carefully the effects of their prescriptions, are aware that anodynes benumb and depress the activity of the organic nerve cells of the nerves of sensibility, and consequently under their influence the various processes necessary to nutrition and the other organic functions cannot be so well performed as when the system is not under the influence of paralyzing drugs. Consequently it is evident that recovery must in some degree be impeded by the use of anodyne remedies. Electrictity or a warm bath will be found in many cases to be a perfect substitute for anodyne drugs, and it is never attended with any of the unpleasant effects which follow the use of such remedies as opium, morphia, and other drugs of that class. The sleep afforded by the narcotic effects of opium is by no means so refreshing as natural sleep. Indeed, we fully indorse the statement made by an eminent physician at the International Medical Convention, held at Philadelphia in 1876, that one hour of natural sleep is equal to three or four hours of narcotic insensibility. In many cases the use of anodynes can be avoided by urging the patient to bear with fortitude his sufferings, which may be quite too slight to require the use of such powerful remedies as must be applied to secure entire insensibility to pain.

In the case of habitual opium-eaters we have found the greatest obstacle to recovery to be the entire loss of fortitude to endure even a very slight degree of pain, which condition had doubtless been brought about by the habit of taking the narcotic for the relief of every unpleasant sensation. We have no sympathy with the class of medical fanatics who would allow a patient to die from sheer exhaustion from pain rather than administer a narcotic. We sometimes find it necessary in practice to employ opium, morphia, belladonna, and in fact, the whole list of anodyne remedies; but we restrict the use of these drugs as much as possible, and exhaust every other means of relieving pain before resorting to them. This is the practice which we heartily commend to every physician, and which ought to be insisted upon by all intelligent persons so far as their influence may extend. The common and almost unrestricted use of opium by physicians has made the common people so familiar with the drug that its poisonous properties are seldom thought of. It is regarded as a great boon for

the relief of pain, as it is, and so is resorted to on any and every occasion when discomfort is experienced which cannot be relieved otherwise. This ignorance or apathy respecting the injurious properties of the drug undoubtedly lies at the bottom of that most pernicious practice,—the use of anodynes in the form of paregoric, Mrs. Winslow's Soothing Syrup, and other narcotic or anodyne mixtures for the purpose of quieting restless or troublesome infants. Thousands of infants die annually in consequence of this pernicious practice, and we cannot help believing, in view of this terrible sacrifice of human life, that it would be a boon, to the rising generation at least, if narcotics and anodynes of every sort were blotted out of existence. The treatment of opium poisoning and the opium habit are fully considered in other connections.

Belladonna, another prominent member of this group of drugs, is also very largely used as an anodyne, although to a far less extent than opium, in its various preparations. One of the most characteristic effects of belladonna is its power to dilate the pupil of the eye. This was one of its first observed effects, and the drug has been very largely used by ladies for this purpose in order to give to the eye an increased brilliancy. In certain diseases of the eye in which inflammation of the structures about the pupil occasion danger to the sight by causing adhesion of the iris to the cornea or lens in such a position as to prevent the admission of light into the eye, belladonna has an exceedingly useful effect to produce dilatation of the pupil, thus withdrawing the iris from the seat of danger until the inflammation has been subdued by the proper means. We have seen many eyes saved by this means which would otherwise undoubtedly have been sacrificed. Belladonna is also of great service to the oculist by enabling him to dilate the pupil to such an extent as to admit of a thorough examination of the whole interior of the eye by means of an ophthalmoscope. This drug has also been found to be a physiological antidote for opium-poisoning.

Hyoscyamus and *stramonium* produce an effect upon the eye similar to that of belladonna, though in a much less degree.

Anesthetics.—This is a class of drugs which occasion the loss of consciousness by the inhalation of their vapor. Their effects are very largely due to their exceeding volatility, by means of which they are taken into the system very rapidly. Various theories have been proposed to account for their effects. The most probable is that their so-called

action is anti-vital; that is, wholly due to the reaction of the system against them. The principal anesthetics are chloroform, ether, bichloride of methyl, and nitrous oxide.

Chloroform is produced by the action of chlorine upon alcohol. It has a hot and sweetish taste, and a fragrant and peculiar odor. It is heavier than water, and sinks when dropped into it. When placed upon the skin and covered with a cloth, it will cause a blister; and when taken into the mouth or stomach, produces a burning sensation. When inhaled, it causes first a feeling of excitement or exhilaration accompanied by roaring in the ears, with strange and peculiar sensations. The patient generally has a feeling as though the objects immediately about him were a long distance off. This gradually fades into semi-unconsciousness, which is accompanied with visions and illusions. During this stage, patients weep, laugh, talk, pray, rave, or become violently obnoxious. This stage usually lasts but a few minutes, and gradually passes off, when the patient sinks into complete unconsciousness. The first stage very closely resembles that of alcoholic intoxication. In the second stage the patient is unconscious, and lies perfectly quiet. It is during this condition that surgical operations are performed. If the inhalation of vapor is continued, the third stage is produced, which is one of narcotic poisoning accompanied by stertorous breathing and complete relaxation of the muscles. It is one of great danger, and should be carefully avoided in the administration of chloroform. In the first stage the pulse is very greatly quickened; in the second stage it should be about normal; in the third stage it becomes very weak and frequent. Chloroform has a very depressing influence upon the heart. In cases of death from its use, the result is generally due to paralysis of the heart. Of the two most largely used anesthetics, chloroform and ether, chloroform is without doubt by far the most dangerous. It has been shown by carefully collated statistics that it produces death on an average in about one case in 3,000 inhalations. The treatment for threatened death during chloroform inhalation is given under the head of "Artificial Respiration."

The danger in the use of chloroform is now generally conceded by experienced surgeons to be so great as to render its use unjustifiable except in cases where ether cannot be well employed. Although its inhalation is much pleasanter for the patient, and its greater potency as an anesthetic renders the use of a smaller quantity sufficient to produce the desired result, these advantages are overbalanced by the

greater danger to life entailed by its use. Experiments made at the Philadelphia Hospital have shown that persons may be anesthetized with chloroform in sound sleep without being awakened, and there is some evidence to show that the drug has sometimes been employed in this way by burglars for aiding them in their operations. Persons who are sleeping lightly, however, will be awakened by the strong odor and irritating effects of the gas.

Ether is a colorless, volatile liquid obtained by treating alcohol with sulphuric acid. It is very inflammable. Its vapor is two and one-half times heavier than air. It has a very strong, peculiar odor and taste. When inhaled, its effects are similar to those of chloroform. It produces in addition unpleasant choking sensations, which frequently cause great discomfort to the patient. The effect of ether is different from that of chloroform, also, in producing, a short time after the giving of the inhalation, a brief period of at least partial unconsciousness and insensibility sufficient to allow the performance of short, even though painful, operations. In the performance of such surgical operations as the removal of the toe-nail, circumcision, and similar operations requiring but a few minutes for their completion, we always endeavor to take advantage of this short period of insensibility to pain, and thus avoid the necessity for the inhalation of so large a quantity of this drug as is usually necessary to produce profound anesthesia. We have in some instances performed quite severe operations in this manner while the patient was entirely conscious, though insensible to pain. When death occurs from the inhalation of ether it is the result of arrested respiration rather than its effect upon the heart, which is shown by the fact that the pulse will continue for some time after respiration has been wholly arrested. Its effects upon respiration are produced slowly and are wholly observable, so that there is more warning than is the case with chloroform. On this account, ether is a much safer anesthetic, and is rapidly replacing chloroform for this purpose.

It is important to recollect that both ether and its vapor are highly combustible, as also that, being heavier than air, it will sink to the floor. A light held two or three feet above a sponge saturated with ether will not occasion any very great degree of danger, while the opposite would be the case if it were held below. In an atmosphere highly impregnated with the vapor of ether, a flame will sometimes flash to a sponge lying several feet from the lamp or gas-jet.

Dr. B. W. Richardson has called attention to the astonishing fact that in various parts of Ireland, particularly in Dublin, Cork, Belfast, and several other cities, together with a number of small villages in the "Mountains of the North," ether has been substituted for alcohol as an intoxicant. In one small place, known as Draperstown, ether is regularly sold in groceries and other small retail stores. The effects of ether-drinking are similar to those of alcoholic intoxication, except that the effects are much more evanescent.

Cocaine.— This is a comparatively anesthetic drug, but possesses such remarkable properties that it has in the short time which has elapsed since its discovery, become very widely known. The injection of a two to four per cent solution of cocaine suffices to establish complete anesthesia in the tissues near the point of injection. If injected into or near a nerve trunk, the anesthesia extends to the parts to which the nerve is distributed. It is a deadly poison, however; hence it must be very carefully employed.

Cocaine is of all felicity-producing drugs, the most dangerous, because the most fascinating. It destroys both mind and body.

Water Injection.—The hypodermic injection of water has also been shown to possess useful anesthetic properties. It must be injected in such a manner as to cause distinct blebs in the skin. A little salt is added to the water (about six parts to one thousand) to lessen the irritation induced, which is quite severe with pure water.

Nitrous Oxide is a colorless, almost odorless, gas of sweetish taste. It is made by the distillation of nitrate of ammonia. Its use as an anesthetic exceeds that of any and all other anesthetics together, as it has for a number of years been employed very largely by dentists in the extraction of teeth. It is only fit for use in such minor operations as tooth extraction, the opening of felons and abscesses, and similar operations. Its anesthetic effects have, by recent experiments, been found to be wholly due to depriving the blood of oxygen, since similar anesthetic effects are produced by the inhalation of pure nitrogen, hydrogen, or any other gas which will not support respiration. The exciting and exhilarating effects which frequently accompany its use are thought to be due to a specific influence of the gas. There is some evidence, however, that these effects may also be simply the result of the deprivation of oxygen. Its anesthetic effects are produced very rapidly, and are equally transient in duration, no unpleasant effects following its administration. Its use is generally considered perfectly safe; but that this

is not the case is indicated by the fact that several deaths from its use have been recorded. The infrequency of death from its use is probably due to the short time required for the operations in which it is generally employed. Large quantities of this gas, and water impregnated with it, are sold under the name of "compound oxygen," from which the most marvelous effects are said to be obtained. From information recently received we are satisfied that little good is accomplished by this agent.

Bi-chloride of methyl is closely allied to chloroform in character, as its use is attended with the same danger. It has been little employed, and probably will never come into general use.

Depresso-Motors.—The drugs of this class are so called because they lessen the activity of the spinal cord. The principal drugs which have this effect are *calabar bean, bromides of potassium, sodium, ammonium,* and *lithium, chloral* and *bromal hydrates, nitrate of amyl, lobelia, gelsemium, tobacco,* and *conium.*

Calabar bean contains an alkaloid called *physostigma,* to which its poisonous properties are due. In fatal doses it produces death by paralysis of respiration, which is undoubtedly due to its poisonous effect on the nerve-centers. One of its most peculiar effects is to cause contraction of the pupil, for which reason it is frequently useful in the treatment of affections of the eye and to counteract the dilating effect of belladonna.

The *bromides of potash, sodium, ammonium,* and *lithium,* have also a depressing effect on the spinal cord, on which account they are very largely used in the treatment of nervous diseases, particularly epilepsy. Probably there is no drug which has so powerful an influence upon the disease mentioned as bromide of potassium. It will undoubtedly check the epileptic convulsions, and numerous cases are recorded in which the occurrence of convulsions has ceased after the long-continued use of this drug. We have used it in quite a number of cases of this disease, but our experience has been that, employed alone, it is a very unsatisfactory remedy, and will rarely secure anything more than temporary relief. In addition to this it must be said that it is a powerful irritant to the stomach, often occasioning serious disturbances of the digestion, and so operating directly against those measures which must be the most permanently useful in securing recovery from the disease. As we shall show elsewhere, epilepsy may be successfully treated without the use of bromide of potassium, which, when employed in such a manner as to occasion irritation of the stomach, really does more harm than good.

The drug may be sometimes useful in interrupting the paroxysms of the disease, but it should not be depended upon as a curative agent, since a cure can only be brought about by improving the nutrition and re-inforcing the vital energies of the system; and the almost universal connection of some degree of impairment of the digestion with epilepsy is a strong argument against the very common use of bromides.

Hydrate of Chloral is a drug which has come to be used within the last three years, and has been most extensively abused. Like the other drugs of this class it has a powerfully depressing influence upon the central nervous system, by means of which it produces a tendency to sleep. Sleep under the influence of chloral, however, is by no means identical with natural sleep. In the latter condition the brain contains very little blood, being pale and anemic, as a result of which there is complete rest, at least of the cerebrum and higher nerve-centers of the brain, while in the sleep under the influence of chloral the blood-vessels of the brain, as well as of other parts of the nervous system, are dilated and gorged with blood, a condition similar to that produced by alcohol in narcotic doses. So great an amount of harm has been done by the use of this drug that we think the world would have been better off had it never been discovered. Dr. Richardson, as well as other observers, has shown that its employment for its narcotic effects since its discovery, scarcely ten years ago, has become very extensive. There are now, especially in large cities, many persons who take chloral in enormous doses as habitually as alcohol and opium are taken. Its effects on the system are in the highest degree pernicious. It produces changes in the blood similar to those which are found in scurvy, producing, in fact, nearly all the other symptoms of that disease. The long-continued use of chloral as a medicine produces effects not dissimilar to those occasioned by its non-medicinal habitual use. We regard it as a poisonous drug which could very well be dispensed with. We have rarely found any occasion for its use, being usually able to substitute some better remedy in cases in which it is supposed to be indicated.

As a local application, however, we have frequently found it useful where the object is to cause the absorption of morbid tissue and to lessen too profuse secretion, as in some cases of inflammation of the pharynx. Its use as a gargle has also been highly recommended in diphtheria.

Nitrite of Amyl is a volatile liquid with a peculiar odor. It is prepared from fusel-oil. On account of its great volatility it is chiefly used in inhalation. Its effect is to produce great fullness and distension of the

blood-vessels of the head, accompanied with severe pain, flushing of the face, and difficult respiration, with violent action of the heart when anything more than very small doses are inhaled. It also has the peculiar effect to cause surrounding objects to look yellow to a person under its influence. One of the most marked effects of this drug is to destroy the power of the blood corpuscles to absorb oxygen. On this account its inhalation produces a distinct feeling of threatened suffocation. The only cases in which we have found the drug of any use have been in reliev'ng the paroxysms of obstinate cases of asthma until the effects of other remedies could be secured, and in preventing epileptic convulsions. It should be taken with very great care, only a few drops being placed on a handkerchief and inhaled for a minute or two. It should be remarked that the full effects are not felt until a minute or two after it has been withdrawn. It is certainly sometimes very useful in interrupting the continued convulsions present in what is termed the *status epilepticus*, in which the paroxysms often follow each other in rapid succession. We have had patients under treatment who carried a small vial of the drug constantly with them, and whenever they felt the premonitory symptoms of the paroxysm, by holding the bottle to the nose and taking a few deep inspirations, were enabled to prevent the occurrence of any further symptoms. It, of course, has no curative value, but it must be acknowledged to be of some real service in such cases. In all cases which were relieved in this way which we have had under treatment, resort to the drug was found unnecessary after the first two or three weeks.

Lobelia.—This common drug, made familiar by its almost universal employment by Thompsonian doctors and physio-medical physicians, produces in both man and animals the most intense prostration, which is usually indicated by feeble pulse, cold sweats, great relaxation of the muscles, and emesis. Many cases of fatal poisoning have been produced by it. Its general effects are, in fact, almost identical with those of tobacco. It was formerly much employed for its relaxing effects in whooping-cough, epilepsy, and tetanus, but it has been generally abandoned in the treatment of those affections, as much less dangerous remedies have been found to be equally or more efficient.

Tobacco.—The effects of tobacco upon the human system have already been so fully described that we do not need to notice this drug at length in this connection except to say that its poisonous effects are so rapid and powerful, that, although formerly much employed, it is now very seldom used. About the only useful service which it can perform

is in the destruction of vermin, but its use for this purpose must be condemned, since numerous cases of fatal poisoning have occurred even from its employment in this manner.

Gelsemium.—This is an alkaloid whose poisonous character has been well shown by its fatal effects, as small a quantity as one-sixth of a grain having proved fatal to a man. When taken in anything more than the smallest doses, it produces dilatation of the pupil, dizziness, great weakness, and frequently double vision. Death, in poisoning, is produced by paralysis of the circulation.

Alteratives.—This term is applied to drugs which, when taken into the system, occasion a change in the functions of various vital organs, by means of which the processes of nutrition are modified. In other words, they are supposed to alter the vital actions taking place in the body. The various medicines which are supposed to purify the blood, belong in this class. It is, however, in the highest degree probable that by their use, the opposite, rather than purification, takes place. It seems to us to be clearly evident that the so-called action of these drugs is wholly due to a modification of the vital processes occasioned by the efforts of the system to rid itself of the poisonous elements of which it can make no use. The principal drugs employed for alterative purposes are *arsenic* and its preparations, *mercury* in numerous forms, *iodine* in various combinations, *cod-liver oil*, *phosphoric acid* and *phosphates*, *colchicum*, *sarsaparilla*, *sassafras*, and *dandelion*. Most of these drugs are so largely used that it will be worth while for us to give each some attention.

Arsenic.—The drug known by this name is a compound of metallic *arsenic*, or *arsenicum*, with oxygen, called *white arsenic*, or *arsenious acid*. When thrown upon hot iron, it volatilizes with a peculiar, garlicky odor. It is an exceedingly active poison, and even when largely diluted with water it is a severe irritant. When swallowed in considerable quantities, it produces intense inflammation of the digestive organs, and speedy death. When smaller doses are taken, death may not occur for two or three days. If the body is examined after death in the latter class of cases, in addition to the irritating effects of the poison upon the mucous membrane with which it comes in contact, it is found that great changes have taken place in nearly all the tissues of the body, the muscles, liver, kidneys, and various other tissues having undergone what is termed fatty degeneration. When taken even in medicinal doses for

skin diseases and other affections, for which it is usually prescribed, for a long time some of the same poisonous symptoms are occasioned, the more common of which are puffiness under the eyes, and sometimes dropsy, together with the appearance of albumen in the urine and casts, the well-known sign of acute inflammation of the kidneys. The especial effects upon the kidneys are probably due to the fact that the poison is chiefly eliminated by these organs, as it can be detected in the urine in a very short time after its administration. The most common uses of arsenic are in obstinate cases of ague, inveterate skin diseases, dyspepsia, and nervous disorders. In view of its poisonous properties, its use as a medicine should be restricted as much as possible. We seldom find occasion for its use, and prefer to substitute other remedies less harmful in large doses, or in small doses, when long continued. There is certainly no small danger in the careless manner in which uneducated persons often resort to this agent as a remedy in diseases of the skin. Some popular nostrums recommended for skin diseases contain arsenic, and are most pernicious on this account.

Mercury.—This drug, once known as the "Samson" of the materia medica, is now much less used than formerly. It is a powerful mineral poison in all its combinations, being most rapidly fatal even in small doses in the form known as *corrosive sublimate*. The first symptoms of mercurial poisoning, when it has been taken into the system, are seen in the mouth, consisting of a fetor in the breath, and soreness of the teeth. Very soon the patient discovers a metallic taste, the gums become swollen and soft, and bleed profusely on very slight abrasion, accompanied with a profuse flow of saliva. If the use of the drug is persisted in, the gums become swollen and inflamed, and marked by a red line at the junction of the teeth. The tongue also becomes swollen, sometimes enormously, protruding from the mouth so as to prevent its closing. The teeth become loosened in their sockets. The saliva is increased in quantity, becomes ropy and viscid, and pours out over the swollen and lacerated lips. The whole system is feverish. This condition of things often becomes worse, so that the teeth fall out of their sockets. Large portions of the gums and cheeks slough away, leaving the patient scarred and disfigured for life. The jaw-bones undergo necrosis, large portions separating and coming away after long periods of suppuration. The blood becomes thin and deficient in red corpuscles. Epilepsy, insanity, scurvy, paralysis, resembling that from lead-poisoning, and necrosis of the bones, are among the results of the use of mercury in large doses and for a considerable time.

The old-fashioned treatment of fevers by mercury has been almost wholly abandoned, and there seems to be an increasing and wholesome inclination to substitute for it less harmful remedies. The experiments of Dr. Bennett in Edinburgh, and of a number of other careful observers, have shown that the belief in the efficacy of mercury as a cholagogue, or liver stimulant, has been entirely a mistake; in fact, the results of a large number of experiments show that instead of increasing the amount of bile secreted by the liver, the quantity is actually decreased when mercury is taken. It is true that a large dose of mercury will occasion the appearance in the bowel discharges of a considerable quantity of bile; but as Dr. Chambers very pertinently remarks in explanation of this phenomenon, this is simply due to the fact that the bile has been so poisoned by the mercury administered that it cannot be absorbed and used in the system, and hence is discharged.

It should be borne in mind that the bile is a secretion as well as an excretion, and that the larger share of this fluid secreted is taken up with the food, the absorption of which it greatly promotes, and is used in the system, only the waste and excrementitious products being allowed to escape with the detritus of the food. The effect of the mercury is to so change the composition or qualities of the bile as to render it useless and unfit for absorption, consequently that which should be taken up in the system is lost and carried away with the useless elements of the food. Recent researches have shown that "biliousness" is really not due to any fault of the liver, but to the development of microbes in the alimentary canal. There is probably no agent so effective in the destruction of microbes as the compounds of mercury. It is very probable, in view of these facts, that the beneficial effects which so many practitioners have attributed to the influence of mercury upon the liver, are really due to its antiseptic or disinfectant properties. It is very desirable that some effective germicide shall be discovered which shall be at the same time innocuous to the tissues.

It is probable that the liver often eliminates a large portion of the mercury which may be taken into the system, partly because it first receives the drug through the medium of the portal vein, after it has been absorbed, partly on account of the well-known fact that it possesses the peculiar property of retaining within its tissues various metallic substances, such as lead, copper, and arsenic, as well as mercury. It is for this reason that the chemist, in searching for evidences of death from metallic poisoning, is anxious to secure the liver for

examination, particularly if there is suspicion that the poisoning has been effected by a slow and somewhat long-continued process. It is also stated by authority which we have good reason to consider reliable, that mercury has in some instances been found in the bones in a metallic state. It is said that an Italian professor once astonished his students by striking his lecture-desk with the bone of a human being and thereby causing countless numbers of minute globules of mercury to roll out upon the table. During life the patient had taken considerable quantities of mercury for a long time, and it seems that the metallic element had been stored up in the bones in such quantities that it could be shaken out in a metallic state after death. The fact that mercury has some particular affinity for the bones may be inferred from the statement of Prof. Gross, in his great work on surgery, in which, in speaking of syphilis as a cause of necrosis, he states that "the history of this disease has shown that the osteitis growing out of it is more apt to occasion death of the bone when the patient has been subjected to three courses of mercury for his cure than when the malady has been treated on general antiphlogistic principles."

The quotation from Prof. Gross also brings to light another fact of very great importance, namely, that in syphilis, one of the diseases in which mercury has been considered by many as a real specific and absolutely essential to recovery, it is by no means so useful or harmless as its advocates have generally supposed. It is an omen of good that at the present time numerous physicians, many of much eminence, are beginning to entertain serious doubts of the efficacy of mercury in the treatment of these diseases also; and we should not be at all surprised if within the next ten years this, the so-called "Samson" of the materia medica, should be reduced in the eyes of practitioners, at least, to the proportions of a dwarf, if it is not annihilated altogether, which in our opinion would not be a serious detriment to the world, since all possible advantages sacrificed would be much more than counterbalanced by the damage which would be obviated. Dr. Wood has stated on this point, "There has arisen a school of syphilographers [physicians devoted to the treatment of syphilis] who assert that the drug is not only not necessary, but is in all stages and all cases of the disease most injurious; that the worst symptoms of the disease are due, not to the constitutional affection, but to the remedy given for its relief." Although never having made a specialty of the disease in question, we have treated a sufficient number of cases to demonstrate to our satis-

faction that the views entertained by the class of specialists referred to are entirely correct. We were glad to notice not long since an able article in the *British Medical Journal*, the author of which maintained that syphilis could be much more successfully treated without mercury than with. The opinions of the author are entitled to some consideration, for his position is Surgeon of Militia in the Medical Corps of the British army, and Assistant Professor of Pathology in the Army and Medical School at Netly. The article referred to was an abstract of a paper read by him before the meeting of the British Medical Association in 1878. He cites hundreds of cases of syphilis successfully treated by him in all stages of the disease wholly without the use of mercury. He says distinctly, "The practice which in the main guided me in the treatment of syphilis was the practice of avoiding mercury as much as possible. My sheet-anchor has in all cases been the frequent employment of hot-water baths." He suggests to those "who hold that the specific action of mercury is absolutely necessary for the eradication of syphilis from the organism, to consult the works of Hughes, Bennet, Lancereaux, etc., for a list of observers, committees, or councils, that have declared in favor of the same treatment of syphilis."

The facts as shown by a large and increasing number of observers with reference to this disease, indicate that the use of mercury often merely checks or obscures the symptoms of the disease. What is needed to effect a cure of this terrible malady, so far as a cure can be effected, is to aid nature in the process of eliminating the poison with which the system of those suffering from the disease is contaminated.

Mercury certainly possesses a remarkable power over this disease in checking its manifestations, as in staying the advance of an ulceration in the throat, or the development of a growing tumor in the brain. It is consequently of material service in cases of this sort, but it must not be relied upon as a real curative agent, since while checking the manifestations and symptoms of the disease, and so affording a false feeling of security on the part of the sufferer, it only hides the malady, and postpones to a later period the terrible punishment which nature has made a penalty of sexual vice, and commonly inflicts, if not apparently upon the individual transgressor, upon his innocent children. We have elsewhere pointed out what we believe to be a rational method of treating this disease, and hence need not give further attention to the subject in this connection. Before leaving the subject of mercury, however, we

should mention another fact which ought to be generally known, though we think it is not mentioned in works on poisons, that calomel, one of the mildest forms in which mercury is administered, if taken into the stomach in connection with chloride of sodium, or common salt, may, through chemical reaction with the salt, be converted into corrosive sublimate, a much more powerful poison, and may produce serious and fatal consequences.

Iodine.—Iodine in its pure state occurs in crystalline scales, with a bluish metallic lustre. It is quite volatile, having an odor similar to that of chlorine, and a very hot and acrid taste. At a temperature a little above that of boiling water it melts, and is converted into a beautiful purple or violet vapor. It has the peculiar property of turning starch blue, which effect is made of practical utility as a test for this drug. That iodine is a powerful poison is shown by the fact that when given in any but very small doses, it produces the effects of poisoning, such as ringing in the ears, salivation, vomiting, diarrhea, cutaneous eruptions, and palpitation of the heart, with great loss of flesh, sleeplessness, hypochondria, etc. When its use is continued a long time, though in small quantities, it produces atrophy, or wasting, of certain glands of the body, such as the breasts in the female and the testicles in the male. On account of its effect in producing absorption of tissue, it is often used for the treatment of abnormally enlarged glands and other growths, sometimes with the effect to occasion their disappearance. Iodine is much used in the later forms of syphilis, in which disease immense doses of the drug are sometimes taken. We have seen persons who were taking an ounce of the drug a day. This usually produces a skin eruption, but certainly has the effect to stop the progress of the morbid action, as when rapid ulceration is taking place, as in ulceration of the throat and the internal structures of the nose. We believe the drug to be of real service in some of these cases, as well as in certain cases in which morbid growths of a syphilitic character have taken place in the brain and produced serious interference with the functions of that organ. In numerous cases it has been shown that through the administration of iodide of potassium marked cases of this sort have been cured, and it has thus been the means of saving life. When taken internally to cause the absorption of such growths as goiter, it produces absorption of the other glands mentioned as well as of the abnormal growth. It generally happens, also, that after the use of the remedy is discontinued the growth re-

turns, but the natural glands which have been affected by it do not gain in size. Iodine is also of service in the treatment of some surgical cases, as hydrocele, cases of pleurisy in which effusion has taken place, and for injections into cavities from which pus has been drawn, to prevent its re-formation.

Iodide of potash is said to be useful in chronic rheumatism and gout, but we have never seen any good from its use, and believe that these diseases can be treated far more successfully without it, as we have proven in numerous instances.

Iodoform, a drug which is prepared by the action of iodine upon chloroform, has recently come into use to some extent, and from the opportunity we have had of testing it we think it to be a very useful agent. When sprinkled upon foul ulcers it has the effect to cleanse them, and so modifies their action as to enable healthy granulations to form and healing to take place. In cancer of the uterus, chronic uterine inflammation, and some other affections occurring in this region in females, we have found it very useful in relieving pain, correcting fetor, and apparently inducing a healthy action. We have found it useful also in relieving painful maladies where the patient was not willing to submit to an operation for a radical cure.

Cod-Liver Oil also has been much praised as an alterative, but there is a great difference of opinion respecting its virtues. To the majority of persons it is nauseating, is frequently ejected from the stomach, and often causes indigestion together with looseness of the bowels. It is disposed of by the digestive organs with great difficulty, which accounts for these effects. We prefer to prescribe for persons who require fatty matter in addition to what they receive with their food, sweet cream, which is the most easily assimilated of all forms of fat. Cod-liver oil has received much praise as a remedy for consumption on account of its supposed alterative effects. Recent observations in relation to cod-liver oil have shown that its so-called medicinal virtues are due to a decomposition which it undergoes in its manufacture. It is simply a questionable form of fatty food.

Phosphoric Acid is a product which results from the burning of phosphorus in the air. It has also been much praised as an alterative. It is sometimes used in solution in the pure state, but more often in the form of what are termed phosphates, particularly phosphate of calcium. Many preparations of phosphates are offered for sale by druggists under a great variety of names, as "chemical food,"

"compound syrup of phosphates," "phosphate of lime," etc. There has been much discussion as to the possibility of the assimilation of the phosphate of lime and other phosphates artificially prepared. Some very eminent physicians express the decided opinion that very little, if any, of the preparations of phosphorus artificially made are assimilated when taken into the stomach. Hagar, an eminent German physician, claims to have shown this to be the case with phosphate of calcium, which is considered the most important and is the most freely employed of all. Applying the well-known principle of physiology, that animals can assimilate only organized matter, the assimilation of inorganic matter being confined wholly to vegetables, there would seem to be no difficulty in settling the question of the assimilation of artificially prepared phosphates. There are many persons, however, who claim that the phosphates of lime, iron, and a few other mineral substances, are exceptions to the general rule, though they offer no proof that such is the case. The arguments against this theory are very strong, and, indeed, they seem to us to be unanswerable. They may be summarized as follows:—

1. The fact that in all of those cases in which phosphates are supposed to be needed, the urine is loaded with phosphates, shows very clearly that the difficulty is not a deficiency in the supply of phosphates in the system, but a deficient assimilation or continued loss of these elements.

2. An abundant supply of phosphates is furnished in the food, and in a condition of such intimate combination with the other elements of food that absorption must take place with readiness. The amount of phosphates administered in the conditions supposed to require them is wholly inadequate to supply the requirements of the system. Indeed, when compared with the amount furnished in ordinary food, it is entirely insignificant. The most liberal prescription of phosphates would not exceed thirty or forty grains a day, while the amount of the salts taken in the food in a single day is about ten times as much. If the diet consisted entirely of oatmeal, 340 grains of the salts would be taken in one day. A proportionate quantity of meat would contain 375 grains of the salts, while an equivalent amount of potatoes would furnish to the system 434 grains,—more than ten times the maximum amount of phosphates ever administered. But Dr. Ringer, of London, asserts that not more than three to six grains of the artificially prepared lime salts can be absorbed in twenty-four hours;

consequently, the greater share of what is administered in ordinary medicinal doses is wasted, and the comparison between the amount which can be received into the system as medicine, and the amount which can be received as food, becomes still more striking, the proportion being, according to this statement, one part of the artificial salts to from fifty to one hundred and fifty of the organic salts found in the food. This view of the case certainly puts the matter in a somewhat ridiculous light, for it could not be considered any possible advantage to administer as a food, with a view to supplying a special want of the system, a substance which was already being received in quantities more than one hundred times as great.

3. Experiments which have been made with the use of these salts furnish evidence that even so small an amount as that stated by Dr. Ringer is not absorbed. The principal evidence is that the amount of phosphates discharged in the urine is not at all increased by their administration, even though large quantities are given. This observation still further confirms the supposition that in cases in which the phosphates are wanting in the tissues the difficulty is faulty assimilation rather than a deficient supply, at least in a great majority of cases. It may be further objected to the common use of phosphates that they are injurious on account of their interference with the functions of digestion. This serious influence of phosphates upon digestion is so well recognized that eminent writers upon therapeutics give warning against their too frequent use. It should be also stated that when used in the large quantities in which they are frequently taken they sometimes form concretions in the bowels, and so occasion serious injury.

The only argument in favor of the use of phosphates is that their use seems to be followed in many cases by improvement in the conditions for which they are administered, whether they are remedial or not. It may be said in answer to this argument, in this case as in the case of many other drugs, that it must be very difficult to decide whether the improvement observed as the result of the phosphates is independent of them, or is in spite of them. Those who contend that phosphates are not absorbed in the blood at all or in so small a degree as to produce wholly inappreciable effects, ascribe the benefit which seems to follow their use to the improved hygiene which is, or at least should be, in all cases prescribed with them. In the experiments of French physiologists it was found that animals died when fed upon food which had been deprived of its natural salts.

Colchicum.—This drug is obtained from the roots and seeds of the meadow saffron, a small plant growing in Europe. The preparation usually employed is what is known as the *wine of colchicum*, prepared from the root. This drug is usually considered to be a specific for gout, for which it is more used than for any other purpose. There is no doubt that when taken by persons suffering with attacks of gout it will frequently relieve painful symptoms in a very short time. That it does not cure gout, however, is sufficiently evidenced by the fact that thousands of people continue to suffer from it notwithstanding their continued use of colchicum. If it were a specific, it should effect a cure instead of mere palliation. It was formerly supposed that colchicum afforded relief from the gout by exciting the kidneys to increased elimination of uric acid. There have been, however, so many observations by competent observers showing that the drug has no such effect, rather diminishing than increasing the amount of uric acid contained in the urine, that the so-called action of the drug can no longer be explained by this theory. Dr. Ringer, in his celebrated work on therapeutics, says that colchicum does not in any way affect the condition on which gout depends, and hence "is merely a palliative, removing for the time the patient's suffering, but, as experience abundantly proves, in no way protecting him from a recurrence of the attack; for it is on all hands accepted that colchicum is inoperative to prevent the return of the attack; nay, many who suffer from it are of the opinion that while the medicine removes altogether the existing attack it insures the speedy return of another. Hence, gout-ridden people generally advise their fellow-sufferers to abstain from the use of colchicum."

It is a very irritating drug, and when taken in any but small quantities, produces the most violent irritation of the mucous membrane. It has been used in rheumatism as well as gout, especially in the chronic form, but there is still less evidence of its utility in this disease than in gout. We see no reason for its employment when there are other remedies, the superior efficacy of which is so well admitted, as elsewhere shown.

Sarsaparilla.—This much-used drug is the root of smilax, a little vine native of Mexico and northern portions of South America. It has been long and widely used as a "blood-purifier" in scrofula, syphilis, and other diseases in which the blood has been supposed to require purification. It also at one time enjoyed great reputation as a remedy

for cancer. Very extensive investigations respecting its effect upon the system have shown, however, that its medicinal properties are very slight indeed, if it is not entirely neutral. The only effects which follow very large doses of a decoction of the root are slight disturbances of the stomach. It has been supposed to excite the action of the kidneys and skin, but experiments show that this is not the case; and, so far as scientific evidence goes, the probability seems to be that it is wholly destitute of medicinal properties. It is claimed, however, notwithstanding the negative results obtained by experiment, that its use in the treatment of such diseases as chronic syphilis and scrofula indicates that in some mysterious way it favorably affects the system in these morbid conditions. But from all that we have been able to learn of its effects even in these diseases, it seems to us very probable that the beneficial results obtained when it has been employed alone, in such a way as to afford an opportunity of judging of its effects, have been due either to the absence of powerful and depressing drugs, to improved hygiene, or to the *vis medicatrix naturæ.*

Sassafras, Taraxacum, etc.—The bark from the root of the sassafras tree, the root of the common dandelion, and quite a number of other common barks and roots, are popularly supposed to possess alterative properties. For this purpose they are very largely used. The evidence of any such fact is, however, of an exceedingly doubtful character. Prof. Wood, of Philadelphia, in his "Materia Medica," says with reference to dandelion that "no effect is to be witnessed from a single dose of the drug however large, other at least than some nausea." With reference to the diuretic properties which this drug is popularly supposed to possess, he says, "The only evidence brought forward to establish this is the vulgar name which the plant bears both in English and in French." Perhaps the best that can be said of these drugs is that they would not be likely to do any very great harm, although only an equal amount of benefit can be expected from them.

LOCAL REMEDIES.

The drugs thus far mentioned are those which are supposed to occasion systemic effects. We will now consider in a somewhat brief manner the particular drugs to which are attributed local effects.

Astringents.—Astringents are of two classes,—vegetable and mineral. Vegetable astringents comprise *tannic* and *gallic acids, oak*

bark, *rose*, *geranium*, *blackberry root*, *persimmon*, etc. Mineral astringents comprise the *alums*, *sulphate of aluminum*, various compounds of *lead*, *bismuth* and its preparations, *zinc* and its compounds, *cadmium*, *copper*, *silver*, and other preparations.

These drugs are called astringents because when applied to living tissues they occasion contraction. This has by some been supposed to be due to the coagulation of albumen; by others, to the contraction of the muscular fibres; but facts do not seem to support either theory. No doubt the real truth is, in this case as in the case of the other drugs, the action of which we have examined, that whatever action is exerted takes place upon the part of the living tissues and not upon the part of the agent employed to produce the action, the peculiar character of the action in different cases being wholly due to the different ways in which various agents are recognized by the tissues. The essential element in all vegetable astringents is tannic acid. It occurs as a light, feathery powder of a light yellowish color and somewhat bitter taste. When absolutely pure, however, it is colorless and free from all odor and taste other than that of astringency. It dissolves readily in water, but is still more freely soluble in glycerine. It combines with various vegetable alkaloids, which makes it a very useful agent in cases of poisoning from morphia, strychnia, and all the other poisonous alkaloids. When combined with iron it forms a black compound, to which is due its utility in the manufacture of ink. It coagulates white of egg, or albumen in any other form, on account of which it cannot be absorbed into the blood in any appreciable quantity.

As the effects of tannic and gallic acids, and various substances which contain them, are entirely local, they are very useful agents in treating a variety of morbid conditions. For example, they may be used to cause contraction of the tissues in spongy gums, in hemorrhoids, in chronic sore throat, or pharyngitis, in which the tissues are very much relaxed and the blood-vessels dilated. Tannic acid is also useful in the treatment of hemorrhage when the source of bleeding cannot be reached, as in hematemesis, or bloody vomiting, hemorrhage from the bowels, etc. It is used to diminish morbid secretions, as in diarrhea, chronic looseness of the bowels, excessive sweating, and various diseases of the skin. It is also very properly used, often with marked benefit, for the purpose of hardening parts which are exposed to friction or pressure, as the under parts of the body in patients who are long confined in bed and unable

to move themselves. It is very largely and usefully employed in the treatment of many local diseases peculiar to women.

Tannic acid is one of the best remedies for poisoning with tartar emetic, as it forms with the antimony an insoluble compound. When it is to be administered internally it should be given in doses of from three to five grains, either in pills or in capsules. When its astringent properties are desired to act on the intestines, or when given for hemorrhage from the stomach, it should be in a powder in doses of from ten to twenty grains. For external application the best preparation is a solution of tannin in glycerine, in the proportion of one part of tannin to four of glycerine. This may be applied as required for the purpose of lessening secretion, as in leucorrhea and chronic ulcers. A decoction of the bark of the white and black oaks is often used as an astringent for external local applications, but their efficacy is wholly due to the tannic acid which they contain.

Alum.—There are two varieties of alum used in medicine, potash alum and ammonia alum. The latter, being cheaper, is the most common. Their properties are identical. What is known as burnt alum is the white powder obtained by heating the drug until the water of crystallization which it contains is driven off. It is soluble in either form in very cold water. When applied to the tissues it acts as a very powerful astringent and irritant. This property is illustrated by its effect upon the mucous membrane of the mouth, with which every one is familiar. It may be used with good effect to arrest slight hemorrhage when the seat of the hemorrhage can be reached. In cases of bleeding from the lungs, a saturated solution should be inhaled by means of an atomizer. It is very frequently used for mouth-washes and for gargles for sore throat, but it should never be thus employed, as it has a very destructive action on the teeth. Sponging with alum-water is a very useful means of arresting the night-sweats of consumptives. It may also be usefully employed in the treatment of chronic ulcers. In the form of burnt alum it is particularly beneficial in those cases in which granulations are exuberant. It is also a good antidote in lead poisoning before the lead salt has been formed, as it precipitates the lead in an insoluble form.

Sulphate of aluminum has similar properties to those of alum.

Lead.—The soluble compounds of lead in weak solution are quite powerful astringents, and hence they may be usefully employed as external applications, if better means are not at hand. All the soluble

compounds of lead are, however, exceedingly poisonous in character, and poisoning from their reception into the system is the most common of all forms of poisoning. Lead poisoning occurs most frequently in those whose occupation exposes them to its influence, as persons engaged in the manufacture of white lead, painters, and other laborers who employ it largely in their work. Poisoning also occurs very frequently through the medium of water which is contaminated by passing through lead pipes, or by standing in lead-lined tanks. Food is also frequently contaminated in the same manner by cooking in tin-lined vessels, in which the tin is adulterated with lead, or by standing in vessels made of the same kind of tin, as in the case of milk. There is good evidence for believing, also, that poisoning not infrequently occurs from the use of fruits and vegetables which have been put up in tin cans made of lead tin. Cases have been observed, also, in which lead poisoning has occurred from cooking in certain kinds of enameled vessels, in which lead was used in the enamel. The effects of lead poisoning are not infrequently seen as the result of the use of cosmetics and hair-dyes, which very frequently contain the salts of this metal. We have met several instances of this sort in which the effects were very severe. The symptoms of lead poisoning and its proper treatment will be described elsewhere.

The symptoms of chronic lead poisoning are generally as follows: The patient first has slight colicky pains, which after some days increase in intensity, being sometimes dull, at other times sharp. They are generally located around the umbilicus, often accompanied with severe retching and vomiting. The bowels are costive, the tongue has a white coat, there is great thirst, and usually no appetite. Sometimes there is also severe headache with delirium and occasionally convulsions, similar to those noticed in epilepsy. One of the most common effects on the nervous system is paralysis of the extensor muscles of the fore-arm which allows the wrist to drop, whence it is known as "wrist-drop." Persons sometimes become cross-eyed under the influence of the drug, from paralysis of the external rectus muscle of the eye. One of the most characteristic symptoms, and one which is always looked for, is a blue line on the edge of the gums where they join the teeth, which is almost invariably found in cases of lead poisoning. The best remedies for lead poisoning with which we are acquainted are the Turkish and electro-thermal baths, the latter of which is found to be particularly advantageous, especially when the primary or galvanic current is employed. By means of elec-

tricity, all of the indications for treatment are met: First, the poison is eliminated from the system by the eliminative effect of the warm bath, and the electrolytic effect of the electricity; second, the paralysis resulting from the disease is relieved, and most successfully treated, by this means, as the exhausted vital forces of the patient are re-invigorated by this powerful tonic.

Nitrate of lead is an excellent disinfectant.

Bismuth, by which is understood the sub-nitrate or sub-carbonate, is much used in vomiting due to an irritable condition of the stomach in neuralgia and cancer of the stomach, in pyrosis, or water-brash, in acute and chronic diarrhea, and in various other complaints. Though often used in very large doses with apparently no injurious effect, the use of this drug is sometimes followed by the most poisonous and even fatal results, which are supposed to be due to the compounds of arsenic which it is very apt to contain.

Of the other metallic astringents, *sulphate of copper* and *nitrate of silver* are the most useful. They may frequently be employed with signal service in the treatment of chronic and obstinate ulcerated surfaces.

Emetics.—This class includes all substances which, when administered by the stomach or otherwise, induce vomiting. The mechanism of vomiting has been elsewhere described.

The principal drugs employed for the purpose of inducing vomiting are *ipecacuanha, apomorphia, mustard flour, tartar emetic, sulphate of zinc,* and *common salt.*

Ipecacuanha.—The ordinary dose of ipecacuanha is from five to thirty grains every fifteen to thirty minutes, administered in a powder. A smaller dose should be used for children. The most pleasant form for administration is the syrup, of which an emetic dose for a child is from one to two teaspoonfuls.

Apomorphia is a drug prepared from morphia. This drug has the curious property of producing vomiting by the injection of an exceedingly small quantity under the skin. The dose required is from one-fifteenth to one-tenth of a grain.

Mustard Flour also is used as an emetic, especially in emergencies from narcotic poisoning. The required dose is a heaping dessert spoonful in half a pint of warm water repeated every ten or fifteen minutes till vomiting occurs.

Tartar Emetic has been much used to produce nausea and vomiting. It is a very powerful drug, as the nausea produced by it remains for a long time and the vomiting is often violent. Its use is rarely, if ever, really necessary.

Sulphate of Zinc is much milder in its effects, as it occasions but little irritation. It may be given in doses of from twenty to thirty grains in cases of narcotic poisoning.

Salt.—A teaspoonful of salt in a pint of warm water, followed by copious warm water drinking and tickling of the throat, is an excellent means of exciting vomiting. Copious warm water drinking and tickling of the throat with a feather or the finger will also aid the effect of other emetics and secure the desired result with smaller doses than would otherwise be required. We have known of several instances in which physicians have given one emetic after another without effect until nearly the whole list of emetic substances had been swallowed, relief being obtained only when the patient was directed to take copious draughts of warm water.

Cathartics.—All drugs which occasion an increased activity of the bowels are termed cathartics, or purgatives. The effect produced by them is called purgation, or catharsis. The mode of action of cathartics has been the subject of much discussion. However their effects may be produced, they are in all cases due to the effort of the system to rid itself of the irritating and obnoxious substance employed. Purgative medicines are classified as follows: First, laxatives, which simply unload the bowels; second, purges, which produce active purgation but do not act as poisons even in large quantities; third, hydragogues, which cause large watery discharges without producing irritation even in large doses; fourth, drastics, which cause great irritation of the intestinal mucous membrane, and in large doses are violent poisons. The principal laxatives employed are the following:—

Laxative Food.—Bulky food, that is, that which contains a considerable proportion of innutritious matter in the form of cellular or woody tissue, produces free and loose discharges from the bowels, while concentrated food produces constipation. It is well known that carnivorous animals, whose food is concentrated, are nearly always constipated, while the opposite is the case with herbivorous animals. So, also, fine wheat flour, meats, and other concentrated articles of diet produce constipation in man, while cracked wheat, graham flour, oat-

meal, Indian meal, and, in fact, the unbolted meal of all the grains, occasion a loose condition of the bowels. The same may be said of most acid fruits, as apples, pears, lemons, and particularly dried fruits. Milk is one of the most constipating of all articles of diet, a fact which renders it for some people an unwholesome article of food.

Manna, the juice of the European ash, is a very gentle laxative when taken in large doses. It has a sweetish taste and is closely allied in its composition to sugar. For an adult, a dose of from half an ounce to two ounces is required to produce a laxative effect. For a child, four drachms should be taken in water.

Carbonate of Magnesia is another very mild laxative. It is frequently employed by persons who habitually suffer with acid dyspepsia, and is used as much to relieve acidity as for its laxative effects. It is taken in large doses of from half a drachm to half an ounce. This use of the drug, however, is often very injurious, since it not infrequently accumulates in the intestines, causing large concreted masses.

Sulphur is also very frequently used as a laxative, but it is much more commonly employed in certain skin diseases, particularly parasitical diseases. It is a well-known remedy for *scabies*, the disease commonly known as the "itch." It is also frequently used in the form of sulphur vapor, both in chronic rheumatism and other diseases in which it is thought to have an alterative effect. Not infrequently, however, when applied to the skin in the form of ointments it produces eruptions.

By the above-named remedies a gentle action of the bowels may be induced, which is not usually followed by any unpleasant effects; but when any vigorous action is desired, castor oil, rhubarb, senna, sulphate of magnesia, or Epsom salts, sulphate of sodium, Rochelle salt, jalap, colocynth, podophyllum, elaterium, gamboge, Croton oil, and a few other substances may be employed. Some of these produce a very violent action of the bowels with copious discharges, as is the case with Croton oil, while others operate much less severely. We give no directions for the use of these more powerful cathartics, since the injury which may result from their use is so great that the risk should never be incurred by non-professional persons.

In our opinion, few classes of drugs are more abused than this. While there are cases in which the speedy and thorough action obtainable by the use of cathartics is very useful, yet the habitual employment of these powerful irritants to the digestive organs is attended

with the most disastrous results. When employed in the treatment of constipation they almost invariably aggravate the very condition which they are employed to remedy. When long continued, they with almost equal certainty produce serious impairment of the digestive organs. The very common practice of taking a dose of salts whenever there is irregularity of the bowels or a condition usually termed "biliousness," supposed to be due to the inactive condition of the liver, has a most pernicious effect. It will not be denied that in many cases the operation of the remedy is followed by apparent relief, and yet the relief is of the most temporary character and is generally obtained at the expense of the exaggeration of the very conditions which gave rise to the unpleasant symptoms in the first place.

The popular supposition, common among physicians as well as non-professional persons, that cathartics give relief by increasing the activity of the liver, seems to be wholly without foundation, since it has been shown by a committee appointed to investigate the subject, with the eminent Dr. Bennett of Edinburgh at its head, that cathartics have no influence whatever to increase the activity of the liver, but, on the contrary, diminish the amount of bile secreted. They undoubtedly often occasion an increased appearance of bile in the discharges, but this appearance has been proven to be deceptive, and it has been clearly shown that the amount of bile secreted in twenty-four hours while the system is under the influence of a cathartic is actually less than is produced at other times. The only apology which can now be offered for the use of cathartics is that they produce a necessary depletion, which simply means that they destroy a portion of the person's vitality, a fact which cannot be desirable under any circumstances, since what is needed in the treatment of disease and morbid conditions is the economizing and saving of vitality rather than its reckless waste.

Fatal injury has often been done in the employment of cathartics for the relaxation of the bowels when intussusception or some other form of mechanical obstruction has been mistaken for simple constipation of the bowels. There is no doubt whatever but that violent cathartics may be wholly dispensed with in the treatment of disease, provided that the numerous other means of securing activity of the bowels are made use of, such as massage, copious water-drinking, the use of electricity, Swedish movements, revulsive applications to the abdomen, stimulant applications to the spine, etc.

The Enema.—For at least nineteen-twentieths of all the cases in which cathartics are employed, warm-water enemata would fulfill all the conditions much better. With reference to the use of cathartics, Dr. Wood says that "it cannot be doubted that the use of purgatives in such diseases as fevers and cholera, with the idea of eliminating some of the *materies morbi*, rests simply upon a crude, unproven, and probably false, pathology." The same reasoning may be applied to the common use of cathartics as a means of purifying the blood. Perhaps the most useful service which can be derived from cathartic drugs is the removal of intestinal parasites, particularly tape-worm and round-worms. For tape-worm they are useful by producing such violent contractions of the intestinal walls as to loosen the grasp of the worm, or, after it has been induced to let go its hold, through the action of some other drug, to expel it from the intestine before it has had time to renew its grasp upon the mucous membrane. Directions for their use for this purpose will be found under the head of "Anthelmintics."

Diuretics.—The principal drugs represented to be useful for this purpose are *squills, digitalis, sweet spirits of nitre, potash* and its preparations, *buchu, uva ursi, turpentine, cubebs*, and *cantharides.*

When taken into the system, these drugs are recognized by the kidneys as elements which cannot be used and are likely to do harm, and so are removed by them as quickly as possible, by which means the amount of urine is largely increased. Incidentally, of course, urea and the other excrementitious principles found in the urine are also eliminated, but the principal object of the increased elimination of urine seems to be to get rid of the diuretic itself. Diuretics are used for five distinct purposes :—

First, in cases of functional inactivity of the kidneys, to stimulate those organs to increased action for the purpose of eliminating urea and other poisonous elements which are naturally removed by the kidneys; second, to remove superabundant fluids from the body, as in dropsy; third, to diminish the irritating effects of morbid urine upon the bladder and other urinary organs, by increasing the quantity of urine by dilution; fourth, to apply medicines of supposed specific virtues to the bladder and urinary passages in certain diseases of those parts; fifth, to change the character of the urine in such a way as to prevent the formation of calculi.

That all of these effects can be produced by the action of diuretics is unquestioned, since if it were not the case their use would have been

abandoned long ago. However, in connection with each one of these uses of diuretics there are several considerations of importance to which we invite attention.

First, we will notice their effect in maintaining the action of the kidneys. The results obtained by the use of diuretics for this purpose are very uncertain. For instance, when the secretion of the kidneys is checked on account of intense congestion, it is evident that the administration of diuretics can be of no use. The kidneys already contain too much blood and have more work imposed upon them than they are able to perform, and to administer diuretics is to put upon them a still heavier burden and to render them still more incapable of performing their proper functions. The same remarks apply to the condition of the kidneys found in acute inflammation. The delicate tubules with which these organs are filled, the purpose of which is to convey away the excretion, are in inflammation filled with the results of the inflammatory process so that the urine which is formed is dammed back, and the organs thus become clogged. To increase the irritating qualities of the urine under these circumstances by the use of diuretics, cannot be otherwise than harmful. Yet, strangely enough, it is under these very conditions that diuretics are most often employed and persistently applied. The futility of such efforts has not infrequently been shown by the rapid improvement of the patient when the agents mentioned are discontinued. Dr. Austin Flint, Sr., president of the Academy of Medicine in New York, reported to that body, a few years ago, a case of inflammation of the kidneys which occurred at Bellevue Hospital, in which, after the failure of all other means to produce a free evacuation of urine and when the case had been virtually abandoned, the patient was allowed to satisfy his desire for fluids by drinking as freely as he chose, with the result of producing immediate improvement in the symptoms. By a continuance of the same measure, which was encouraged when its good effects were seen, ultimate recovery was secured.

Second, diuretics are much used for the purpose of causing absorption of the liquid which has been accumulating in the tissues or in various cavities of the body, as in abdominal dropsy, dropsy of the chest, and anasarca, or general dropsy. While temporary benefit is not infrequently obtained in this way, the measure cannot be considered in any way curative, since it does not reach the cause of the malady, and must, in some degree at least, lessen the chances for recovery by lowering the vitality of the patient and especially by impairing the func-

tions, at least when long continued, of so important organs as the kidneys. Abdominal dropsy is very often the result of disease of the liver in which the function of this organ is very greatly impaired. This, of course, very naturally imposes an extra degree of labor on the kidneys, which are obliged to act, in some degree at least, vicariously for the disabled organ. If in this state of things the kidneys are overstimulated by diuretics, it is evident that the result in the long run must be disastrous, since from continued stimulation the kidneys will greatly lose their natural tone, and so become less able to perform the extra labor which is demanded of them.

It seems to us that the most rational method, both in this class of cases and the preceding, is to facilitate the function of the kidneys rather than to compel them to do more work without increasing their facility for performing their peculiar functions. In the first class of cases, as already intimated, this may be best accomplished by increasing the amount of fluid in the blood and thus largely diluting the poisonous elements which it is the function of the kidneys to separate from the blood, and so rendering the work of elimination easier. In the second class of cases, where superabundant fluid is to be gotten rid of, our experience has been that the work can be much better accomplished, and with far less injury to the system, by increasing the activity of the skin than by overstimulating the kidneys. This may be easily done by the use of hot-air baths, Turkish baths, packs, and a great variety of other means of producing increased perspiration. By this means a large portion of the urea which the kidneys usually eliminate will be removed through the skin, and the kidneys will then be able to render the liver much greater aid in the elimination of the poisons which are usually eliminated by it, but which may also be separated from the blood by the kidneys, and in a slight degree by the skin.

Third, in the use of diuretics for the purpose of soothing and diminishing the irritation of the urinary and genital organs, the desired effect is usually obtained almost wholly, if not entirely, from the simple dilution of the urine, as already shown. This can be effected better by the copious drinking of water than by any other means, especially of very cold water, as elsewhere shown. It ought perhaps to be mentioned also that in cases where the irritation is due to abnormal acidity of the urine this condition may be removed by the regulation of the diet.

Fourth, the application of drugs to the genito-urinary organs

through the urine is certainly a very roundabout method of medication. We have never found difficulty in accomplishing all that was required in the way of local medication by applying the remedies indicated directly to the organs themselves rather than medicating the whole system before reaching them.

Fifth, although great claims have been made for the efficacy of certain drugs in preventing the formation of urinary calculi or in dissolving the calculi after they are formed, no satisfactory evidence has yet been offered that any drug possesses properties of this sort. We may perhaps make an exception in the case of uric acid deposits, which are, in some degree at least, restricted by the use of potash. Experiments which we have made in cases in which there was a very abundant deposit of uric acid with the use of diet in meeting this condition satisfy us that we can with safety say at least that the use of diuretics is not the only means of accomplishing this result. The conclusion of the whole matter seems to be that of all diuretics pure water is pre-eminently the most useful, and that by its use, together with the proper regulation of the diet, most of the indications for the use of diuretics can be fulfilled. We have met with many cases in which great harm had resulted from the long-continued use of diuretics, and we are convinced from observation that the amount of injury thus done is much greater than is generally supposed. Indeed, it is possible that the very extensive employment of diuretics may be one of the causes of the notorious frequency of kidney diseases among the American people.

Diaphoretics.—The drugs known by this name are those which excite an increased activity of the skin. In addition to nauseating and refrigerating diaphoretics, the principal employed are *jaborandi, spirit of mindererus, sweet spirits of nitre, and alcohol.*

Diaphoretics are supposed to produce their effects in four different ways:—

First, by relaxation of the blood-vessels of the skin, as from the use of nauseating remedies, such as tartar emetic and ipecacuanha, This result is undoubtedly obtained from the effects of these substances upon the nervous system. Any drug which produces nausea may have this result. Relaxation of the circulation in the skin may also be produced in a most effective manner by the employment of either dry or moist heat, as in the hot-air, vapor, Russian, and Turkish baths, together with the warm-water bath and the wet-sheet pack.

Second, by diminishing the rapidity of the circulation and thus de-

creasing the amount of blood passing through the skin. In fever the skin is often so congested that the activity of the perspiratory glands is interfered with, as in congestion of the liver, kidneys, and other excreting organs. Certain drugs, by diminishing the amount of blood circulating in the skin, cause perspiration. These are called *refrigerant diaphoretics*. Those commonly employed are *aconite*, *veratrum viride*, and the other drugs which have been mentioned as cardiac sedatives. *Citrate of potash* is often used for this purpose.

Third, by directly exciting the action of the perspiratory glands. This is accomplished by means of drugs which are chiefly eliminated by these glands. The action of the perspiratory glands is also powerfully excited by means of moist or dry heat as applied by the means already mentioned.

Fourth, the activity of the skin may be increased by the copious drinking of pure water or beverages in which it is the chief constituent. The diaphoretic effects are best induced by means of warm or hot water. In order to secure free perspiration it is best for the patient, after drinking freely, to be covered up warm in bed.

The objects to be secured in the use of diaphoretics are, according to the best authorities, substantially as follows:—

First, to arrest diseases not very serious in character when just beginning. This is probably accomplished by causing a flow of blood to the surface, and so relieving internal congestion. The results of checked perspiration and of exposure to cold, such as a general "cold," muscular rheumatism, suppressed menstruation, and similar affections, may often be readily relieved in this way. We would suggest that no other means of producing diaphoresis for this purpose is so effective as heat combined with copious water-drinking

Second, diaphoretics are useful to produce absorption. For this purpose they are especially employed in dropsy. With reference to the employment of diaphoretics, Dr. Wood very truthfully remarks as follows: "None of the medicinal diaphoretics are of sufficient power to be relied upon in dropsy: in order to reduce the effusion, the Turkish, Russian, or hot-water bath must be vigorously employed." By this remark it is clearly seen that the remedies mentioned are pre-eminent above all others as diaphoretics.

Third, diaphoretics are very serviceable in hastening the subsidence of diseases which naturally pass off with a sweat. For this purpose they are chiefly employed in malarial fevers, especially in ague in those cases

in which the sweating stage is not wholly developed. In these cases the wet-sheet pack is, on the whole, far superior to any other agent with which we are acquainted. It is stated that pilo-carpine, a drug recently introduced into practice, will, in many cases, when injected under the skin, interrupt the paroxysm, if administered after the chill is begun, by exciting profuse diaphoresis. Cold sponging is also exceedingly useful in the fever stage of the ague paroxysm, hastening diaphoresis by relieving the intense congestion of the skin.

Fourth, diaphoretics are useful in aiding the elimination of poisonous elements from the blood. There is no doubt, that, by exciting the action of the skin, retained secretions may be rapidly eliminated. By this means the blood may be purified from waste products which are frequently a cause of disease. This mode of treatment is especially advantageous in cases in which there is great inactivity of the kidneys and liver. The amount of urea excreted by the skin when the kidneys are inactive has been shown to be very great. So large a quantity has been secreted in some cases that it has appeared upon the skin as a crystalline powder. A case has also been reported in which uric acid has appeared upon the beard in such abundance as to give it a frosty appearance. It has also been shown that in cases of jaundice the excrementitious elements of the bile are contained in the perspiration. This fact points very clearly to the great importance of employing the most effective diaphoretic measures in all cases in which there is marked inactivity of the liver or kidneys or a generally inactive condition of all the excretory functions. It should always be recollected that profuse diaphoresis usually leaves the skin in a relaxed condition, which renders the person liable to contract cold on account of the diminished tone of the superficial blood-vessels. This danger may be in a large degree obviated by anointing the skin with vaseline, or any other fine unguent, after cool sponging.

Expectorants.—These are medicines which are supposed to modify the secretions of the mucous membranes of the lungs and respiratory passages. There are chiefly two classes, known as nauseating expectorants and stimulating expectorants, the effects of which are quite opposite in character.

Nauseating expectorants are commonly employed in acute stages of inflammation of the air-passages in which the activity of the blood-vessels is so great as to prevent secretion, thus giving rise to very unpleasant dryness and irritation, the result of which is generally violent but ineffectual coughing. By the administration of *ipecac, tartar emetic,* or *lobelia,* the three nauseating expectorants commonly em-

ployed, the action of the blood-vessels will be so depressed, from their influence upon the nervous system, that secretion may take place, and thus the suffering of the patient will be palliated.

Stimulating expectorants produce varying effects. Some of them increase the secretion of the respiratory mucous membrane, while others lessen a too profuse secretion. The stimulating expectorants commonly employed are *chloride of ammonium, seneka, ammoniac, balsam of Peru, balsam of Tolu, benzoin, squill,* and *tar.*

The use of nauseating expectorants, as might be readily supposed, produces a very profound effect upon the general system, and is consequently a very depressing mode of treatment. We have seen cases in which we were satisfied that the patient's life had been sacrificed by the use of tartar emetic and ipecac. In our opinion, these remedies can be dispensed with without diminishing the number of useful remedies, since there are other modes of removing congestion of the respiratory tract which are far more effective, such, for instance, as the warm-blanket pack, which in the acute capillary bronchitis of children produces such magic effects as to be considered almost a specific. We know it to be a fact that many eminent physicians are dependent on this remedy almost altogether in the treatment of this disease, which of all others would seem to require prompt relief of the congestion of the mucous membrane. Fomentations to the chest and the prolonged chest compress are agents of no small value. We have frequently employed, in relieving the condition for which nauseating expectorants are commonly prescribed, hot applications to the chest combined with cold applications to the spine between the shoulders, and have, by this means, often secured almost marvelous results. Indeed, we have never been disappointed in its use in congestion of the pulmonary mucous membrane. All the good results which can be obtained from the use of the stimulating expectorants mentioned can be secured much more promptly, and in a much greater degree, by local applications to the diseased membranes by means of inhalation in the form of atomized spray. The most useful for this purpose are *chloride of ammonium, benzoin, balsam of Peru, balsam of Tolu, tar, creosote, carbolic acid,* and pure water. In many cases in which nauseating diaphoretics are employed, inhalation of pure water in an atomized state will frequently afford the greatest relief. For the use of various stimulating expectorants by inhalation, the reader may consult the article on "Inhalations."

50

Emmenagogues.—These are drugs which are used to promote the menstrual flow. The principal drugs employed are *myrrh, aloes, black hellebore, savine, rue, parsley, cantharides, guaiac.*

The effects which follow their use are produced in some cases by increased circulation of the blood in the uterus, as well as the other abdominal viscera, by excitement of the nerve centers which control the circulation in the uterine organs. Several of the drugs mentioned are frequently used for the purpose of producing abortion. When thus used they are exceedingly dangerous to life, from their poisonous effects as well as from the dangers attending abortion.

Oxytocics.—These are drugs which occasion increased contraction of the uterus, for which purpose they have been frequently employed during labor or immediately afterward. The chief of the class is *ergot.* Until recently, this drug was employed very extensively as a means of increasing the activity of labor pains and hastening the termination of labor. It has been conclusively shown, however, that this practice has been an exceedingly injurious one, and that numerous and most serious accidents in connection with labor, both to the mother and child, must be attributed to its use. Consequently, the former mode of using this drug is now being abandoned by the intelligent part of the profession There are, undoubtedly, cases in which it is useful, as in preventing hemorrhage after delivery, but it should be employed with the greatest circumspection, and never unless its use is absolutely and distinctly indicated. It should also be recollected that even in these cases it can generally be very well replaced by other means of producing uterine contraction, as the employment of cold, the hot douche, and electricity. Ergot has also been successfully used in the treatment of tumors within the cavity of the uterus by its administration in small doses continued for a long time.

In recent years electricity, by the method known as electrolysis, has almost altogether superseded the use of ergot, as being far more positive in its results. Electrolysis often checks hemorrhage and relieves pain without stopping the growth of the tumor. In the majority of cases, a proper surgical operation, by a skilled surgeon, affords the only means of permanent relief.

Epispastics and Rubefacients.—Under these heads are included the various drugs which are used for the purpose of counter-irritation *Cantharides* is about the only epispastic now in common use. It is usually employed in producing blisters. *Ammonia* may be used in

the same way. The principal rubefacients are *mustard, cayenne pepper,* and *Canada pitch.*

Counter-irritation is a remedy which has been employed for ages in the treatment of local inflammations. It is now much less used than formerly, many practitioners having lost confidence in its efficacy for the purposes for which it has been so long employed. This skepticism respecting the value of counter-irritation as a remedial agent, has arisen from two sources: first, the observations of frequent and extensive injury from its use; and second, the impossibility of explaining on rational principles how benefit could be derived from its use. While there is no doubt that an immense amount of harm has been done by the use of counter-irritation in the treatment of numerous diseases, some facts in experience which cannot be questioned seem to show that in some cases some degree of benefit is derived from its use. It has been clearly shown that the old theory of the derivative effect produced by blisters and other counter-irritants, is wholly inadequate to account for any such results, since in a majority of cases in which benefit is supposed to be derived, there is no direct connection between the diseased part and the part to which the blister is applied; as, for instance, when a blister is applied for the relief of pneumonia it is impossible that benefit should be obtained by the withdrawing of the blood from the diseased organ to the surface, since the blood supply of the lungs and that of the chest wall are entirely independent. It is possible that whatever beneficial results are produced by any form of counter-irritation, are produced through the agency of reflex nervous action. The blister is one of the severest forms of counter-irritation. It is usually produced by the application of cantharides or Spanish flies to the skin, the drug being kept in contact with the skin until the desired amount of irritation is produced. Ammonia also will produce a blister if confined for ten or fifteen minutes in contact with the skin. It has the local effect to produce much more serious inflammation than cantharides, and on that account is seldom employed.

The rubefacients are much milder in their effects, not producing vesication unless retained in contact with the skin for some time. Hot fomentations may be considered as the softest form of counter-irritation. The degree of irritation produced may be modified at will by varying the temperature at which the application is made to the skin. By placing a moist cloth upon the skin, and applying a hot

flat-iron over it, the effect is fully as severe as that from cantharides. We have no faith in severe counter-irritation, believing that all the good results which can be secured at all by this means can be obtained by repeated and prolonged irritation in a moderate degree, as from the application of mustard plasters, or, still better, moist or dry heat. Since it is through the reflex action occasioned by means of exciting the nerves of the skin that counter-irritant effects are produced, it is of the greatest importance that the integrity of this structure should be preserved, and hence, counter-irritation of any kind should never be carried to such an extent as to destroy the integrity of the cuticle. In the treatment of cases of acute poisoning by opium and other vegetable alkaloids, the counter-irritant effects of heat, moist or dry, applied to the spine, will produce more marked effects than can be produced in any other way, except by the use of electricity. Indeed, in a case in which we were called in consultation we were able to revive the patient by the application of heat to a degree which was considered little less than miraculous after the nervous system had ceased to respond to the most powerful electric currents, either galvanic or faradic.

Escharotics.—Escharotics, commonly called caustics, include all drugs which destroy living tissue, either healthy or diseased. *Caustic potash, arsenious acid, chloride of zinc, sulphuric acid, nitric acid, muriatic acid, chromic acid,* and *bromine.*

The principal use of these powerful drugs is to destroy morbid growths, principally cancerous structures, and to cauterize poisoned wounds. They are very efficient agents for destroying the poisonous bite of a rabid dog. It is said that if the wounded tissue is thoroughly destroyed at any time before the manifestation of the symptoms of the disease, its course will be prevented. This is known to be the case if the caustic is applied to the part soon after it is bitten.

Caustic Potash is one of the most efficient agents for this purpose, as it penetrates very deeply. The method of applying, is to take a piece of adhesive plaster, cut in it an opening the size of the part to be cauterized, and then apply it to the skin in such a way as to leave the part exposed through the opening in the plaster, making the plaster to adhere tightly all around. Then grease the upper surface of the plaster, and place the caustic upon the exposed surface of the skin. When its action has been continued long enough, wash the part thoroughly with equal parts of vinegar and water. A favorite mode of applying the

potash as a caustic is a combination with chalk, the mixture being known as *Vienna paste.* It is much less energetic in its action than pure potash. When used, it is mixed with sufficient alcohol to form a paste, and then applied as directed for caustic potash. Another mode of applying it, which is said to be almost painless, is to mix morphia with the powder, in the proportion of one part of morphia to three of the powder. Then make into a paste with chloroform. Spread upon a piece of lead plaster, and apply to the part.

Arsenic is a very energetic caustic, and produces the most intense pain. Its use is somewhat hazardous on account of its actively poisonous properties, and hence it should never be employed except by a person fully acquainted with its properties, and the proper mode of using it. Its most useful application is in the treatment of malignant growths, for which it appears to be very well adapted, owing to the interesting fact that it affects the diseased more rapidly than the healthy tissues, so that the cancerous tissue may be destroyed without affecting the healthy parts. In use, it is usually mixed with from eight to ten times its bulk of starch or some other inert substance and applied in the form of paste. It should never, however, be applied to more than a single square inch of surface at a time. This caustic has been largely used by quacks in the so-called cancer remedies.

Nitric Acid is a very powerful and active caustic. Its principal uses are in application to ulcers and small growths upon the skin, such as warts. It should be applied with a glass rod or a splint of wood.

Chromic Acid should be used in the same way, and is employed for the same purposes, as nitric acid.

Bromine, one of the most severe, thorough, and rapid of all caustics in its action, is largely used in cases of gangrene.

Anthelmintics.—These are medicines which destroy intestinal worms, or cause them to be expelled from the intestinal canal. The most efficient anthelmintics are *spigelia,* or *pinkroot, chenopodium,* or *wormseed, koosso, santonin, male fern, pumpkin seeds, and pomegranate rind.*

Pinkroot is the most efficient remedy for round worms, and given in moderate quantities produces only transient unpleasant effects on the patient. It does not destroy, but simply narcotizes the worm, and hence should be used in connection with some active cathartic. The cathartic usually employed for this purpose is senna, and the favorite

method of using is to put together equal parts of fluid extract of spigelia and senna, of which the dose for a child two or three years of age is half a teaspoonful to a teaspoonful, for an adult a tablespoonful, repeated every four hours until it purges.

Wormseed also is a valuable remedy for lumbrici, or round-worms. Used in the form of oil, it is very efficient. The dose for a child three or four years of age is ten drops, which may be given on sugar before each meal for two days.

Koosso is an excellent remedy for tape-worm. For an adult the dose is half an ounce of the powdered flowers taken in water. It should not be taken by pregnant women, as it is likely to produce abortion.

Santonin is usually employed for round-worms. It destroys the worms, but a cathartic is necessary in order to expel them.

Male Fern is used chiefly for tape-worm. In administering it, the patient should take only milk and a little bread for one day, and the next morning, if an adult, should take half a drachm to a drachm of the extract, fasting, and repeating the dose in two or three hours. He should take his dinner at the usual time, and in the evening should take a cathartic.

Pumpkin Seeds are also a valuable remedy in case of tape-worm. They are said to be even more efficacious than male fern, and are perfectly harmless. The seeds should be beaten up with sugar or made into an emulsion with water, and should be taken as directed for male fern.

Pomegranate Root is also useful in destroying tape-worm. A pint of the decoction made from two ounces of the fresh root should be taken in three doses before breakfast. Other directions for the use of anthelmintics will be given in another connection.

MISCELLANEOUS REMEDIES.

Pepsin. — This is the active principle of the gastric juice. It is prepared from the stomach of pigs. In South Africa a preparation is made from the lining coat of the gizzard of the ostrich. In this country, gizzards of ducks, turkeys, and chickens are also used for the active principle they are supposed to contain. A preparation made from these sources and termed "Ingluvine" has been employed to some extent during the last few years. There is no doubt that pepsin may be separated from the stomachs of hogs, calves, and other animals, and that it

possesses the power to dissolve albuminous foods in connection with acids. The extent of its utility as an aid to digestion is, however, by no means well determined. The majority of physicians claim to find great benefit from its use, but careful examination of specimens of pepsin employed have shown that the large share of that used has been nearly inert. It has also been shown that the quantity employed is so small, in comparison with what is necessary to render any very great service, as to be of no real value. It is probably the case that in a large share of instances in which beneficial results have been supposed to be derived from its use, the benefit received was really the result of improved hygiene. It is probable, however, that if care is taken to secure a good quality of pepsin, some benefit may be received from its temporary use in cases in which a deficient supply is produced by the system. Dr. Chambers, of London, an eminent authority in diseases of the stomach, has called attention to the fact that no good can be derived from the use of pepsin for a longer period than two or three weeks, and that its use for a greater length of time is injurious.

After having made a careful study of the stomach fluid obtained after a test meal in more than five thousand cases, in each of which a very careful chemical examination was made, I must admit that the deficiency of pepsin is rarely found in cases of indigestion, and when absent, it is very doubtful whether pepsin will be of any real service. The thing needed is not simply more pepsin, but the ability to make more pepsin in order to supply the lack. Mosso, by passing a stream of water through the stomach of a dog by means of a stomach-tube, found that a dog's stomach was capable of producing enough pepsin to digest one hundred and fifty pounds of meat at a single meal. The average human stomach probably does not possess digestive vigor equal to that of a dog; but when it is abnormally weak, it is not merely pepsin that is lacking, if, indeed, there is any deficiency in this element of the gastric juice, but a failure of all the powers of the organ.

Dry Cupping is an excellent means of treating some affections, particularly lumbago. It may also be applied to the spine with advantage for the relief of symptoms arising from congestion of the spinal cord. The application may be made by means of the regular apparatus, which consists of an air-pump with a properly constructed

cup for application to the skin, or when such an apparatus is not at hand, by a much simpler method, which is always available. Take either an ordinary cupping-glass, a tea-cup, or a small goblet. Drop into the bottom of the cup a little piece of cotton saturated with alcohol and set fire to it. When it is in full blaze, so that the air has been nearly expelled from the glass, invert it and press it upon the part to which the cup is to be applied. The flame will be at once extinguished, so that no pain will be inflicted. As the air within the glass cools, the skin will be drawn up into it and the blood thus attracted to the part. Very powerful effects may be thus produced. Another method of expelling the air from the glass is to hold it over the chimney of a lamp for a few seconds and then apply very quickly without turning the mouth upward, so as to prevent the escape of the hot air.

Charcoal.—For medical purposes only fresh charcoal and that made from the finest woods should be employed. The best charcoal is that made from boxwood such as is used in engraving, from the shells of cocoa-nuts, or from vegetable ivory. We have made the largest use of charcoal from cocoa-nut shells, and have been perfectly satisfied with the results obtained from it.

The particular value of charcoal is as an absorbent. On account of its great porosity it is able to absorb and condense many times its own volume of various gases. When saturated with one gas it is still able to absorb another. It is this property which renders it valuable as a filtering medium. On account of its absorbent and oxydizing qualities it is useful as an antiseptic also. We have used it with marked success in cases of severe flatulency, and also in acid dyspepsia. A great drawback to the use of charcoal is the inconvenience experienced by most persons in taking it. To obviate these difficulties I have had charcoal prepared in the form of tablets, which add to the active properties of the charcoal, and are agreeable to take.

Poultices.—These applications are useful as means of applying moist heat when a prolonged application is desired. The "drawing" effects attributed to them are chiefly due to the stimulating effects of heat. There is little difference in the effects of the various kinds of poultices which are employed. When stimulating effects are wished, as when it is desired to "bring a boil to a head" quickly, or to promote suppuration, the poultice should be applied hot, and renewed sufficiently often to keep up a degree of heat above that of the skin, at

least to 100° F. When soothing effects are desired, as when the application is made to painful wounds, bee-stings, etc., it should be only agreeably warm, and need be renewed only sufficiently often to prevent it from souring or becoming dry. The use of poultices is similar to that of fomentations. In the case of wounds, when the skin is broken, they are often preferable, being softer and so less irritating. The most commonly employed poultices may be made according to the following directions:—

Bread and Milk Poultice.—Place in a basin a handful of fine crumbs of stale bread, from which the crust has been carefully excluded. Pour on boiling milk, stirring all the while, until the mixture becomes of the thickness of mush. Care should be taken to make the mixture perfectly smooth. Spread on a cloth, making the layer a quarter to half an inch in thickness, and sufficiently large to extend well over the part to be treated. The poultice may be applied directly to the skin, or a thin cloth may be placed between. A neat way of making the application is to put the poultice in a muslin bag of proper shape and size, and apply with a cloth between the bag and the skin. Much hotter applications can be borne in this way than when the application is made in the usual manner. This is one of the most conveniently prepared poultices, and is not excelled in efficacy by any other.

Bread and Water Poultice.—The most quickly prepared poultice is that made of bread and water. Pour boiling water upon well prepared bread crumbs in a basin. Let soak until well softened, make smooth with a spoon, and apply as directed above. A still more expeditious method is to take a thick, smoothly cut slice of stale white bread, cut away the crust, dip into hot water, remove at once, lay on a cloth and apply to the part to be poulticed.

Bran Poultice.—This is useful when large poultices are required to be used for some time. Throw two or three handfuls of bran into a milk pan. Set on the stove and pour in enough hot water, while vigorously stirring, to moisten, without making it wet. Throw quickly into a bag prepared for the purpose, in quantity sufficient to about half fill. Fasten the mouth of the bag quickly, spread the bran evenly, and apply as hot as can be borne. When the bran becomes sour, as it usually does in a few hours, procure a fresh supply. Renew the application as often as necessary.

Indian Meal Mush Poultice.—Spread well-boiled Indian meal upon a cloth and apply in the usual way.

Starch Poultice.—Make a moderately thick, smooth paste in the usual manner, and spread upon linen cloth. A very useful application in cases of irritable and inflamed skin eruptions confined to a circumscribed portion of the body.

Slippery Elm Poultice.—Pour boiling water on slippery elm flour, making a mixture of proper consistency for a poultice. Apply in the usual manner.

Linseed Meal Poultice.—The following is the plan recommended by the celebrated Dr. Abernethy:—

"Get some linseed powder, not the common stuff full of grit and sand. Scald out a basin; pour in some perfectly boiling water; throw in the powder, stir it round with a stick till well incorporated; add a little more water and a little more meal; stir again, and when it is about two-thirds the consistency you wish it to be, beat it up with the blade of a knife till all the lumps are removed. If properly made, it is so well worked together that you might throw it up to the ceiling, and it would come down again without falling to pieces; it is, in fact, like a pancake. Then take it out, lay it on a piece of soft linen, spread it the fourth of an inch thick, and as wide as will cover the whole inflamed part; put a bit of hog's lard in the center of it, and when it begins to melt, draw the edge of the knife lightly over and grease the surface of the poultice. [Vaseline may be used instead of lard.] When made in this way, oh! it is beautifully smooth; it is delightfully soft; it is warm and comfortable to the feelings of the patient."

Charcoal Poultice.—Sprinkle fresh, finely powdered charcoal over a bread and milk poultice in a thin layer and apply as usual.

Mustard Poultice or Plaster.—Mix ground mustard with boiling water to the consistency of thin paste. Spread on a piece of thick muslin or brown paper covered with muslin. Apply for ten or fifteen minutes. It should be removed as soon as decided smarting is felt.

Cotton Poultice.—This is a most convenient and cleanly form of poultice, quite as efficient as any, and almost universally applicable. It consists of a quantity of absorbent cotton moistened with water, applied to the part and kept warm by means of a hot bag placed over it. Another mode of applying the cotton poultice is this: Wrap about the affected part a cloth moistened in water; cover this with some impermeable material, as mackintosh or oiled muslin or silk, and then place over all a thick mass of raw cotton to retain the heat. Excellent for rheumatic joints.

Poultices are made from various other substances, but there is no evidence that they possess any real superiority over those described. In case the parts to which the application is made are very painful, a little laudanum may be sprinkled on the poultice; but usually this soothing application is all that is needed.

Gargles.—In certain diseases of the throat, gargles are of much service, if properly applied. As ordinarily used, gargles are of little consequence, since they do not reach the part affected. They are, of course, applicable only to the upper part of the pharynx and the tonsils. In order to bring the fluid in contact with the diseased parts it is necessary to allow the gargle to pass as far back into the throat as possible without swallowing. This requires that the head should be well thrown back. Young children cannot be made to gargle properly, and the fluid should be applied with a swab, which may consist of a small piece of soft sponge attached to a stick or lead pencil, or a soft cloth wound around the end of a stick. The greatest care should be taken to fasten the sponge or cloth securely, as a safeguard against its slipping into the throat of the little patient. When a swab cannot be used without great difficulty, the bulb atomizer may be successfully used.

The objects in the use of gargles are chiefly the following: 1. To produce an astringent effect upon the mucous membrane of the pharynx in cases of chronic congestion of the part, as in chronic sore throat and enlarged tonsils; 2. To soothe irritation arising from inflammation; 3. To remove morbid deposits by dissolving and washing them away, as in diphtheria. The following are a few useful prescriptions:—

Alum Gargle.—Dissolve in a tumblerful of water a teaspoonful of powdered alum. Use in chronic sore throat. Be careful to bring it in contact with the teeth as little as possible, and never use as a mouth wash, as the alum is injurious to the teeth. Rinse the mouth well after using.

Lime Gargle.—Take a lump of lime the size of a large goose egg. Slake it with two quarts of boiling water. Let it settle, and pour off the clear solution. Use as a gargle, or by means of the atomizer. Excellent in diphtheria and croup for dissolving the false membrane peculiar to these diseases.

Chlorate of Potash Gargle.—Put two heaping teaspoonfuls of powdered chlorate of potash into a four-ounce bottle, fill nearly full

with hot water, and shake until the powder is dissolved. Use when cold.

Brandy and Water Gargle.—Take equal parts of brandy and water. Employ when an astringent effect is desired. This solution is not intended to be applied to the œsophagus or any point lower down than the throat, hence it should never be swallowed.

Permanganate of Potash Gargle.—Dissolve in a pint of pure water half a teaspoonful of crystals of permanganate of potash or soda. Use of full strength or diluted with water in cases of sore throat in which the breath is very foul. Also useful as a mouth-wash for fever patients. It turns the teeth brown, but the stain can be readily removed by means of a cloth or brush.

Carbolic Acid Gargle.—To a tablespoonful of glycerine, add ten drops of pure carbolic acid. Mix well and then add three tablespoonfuls of water. Shake thoroughly. May be best used with a swab or by means of the atomizer, though it can be employed as a gargle by adults.

Chlorine Solutions.—(a) One part of a freshly prepared solution of chlorine gas, or chlorinated soda, in three to five parts of pure water, according to the strength of the solution and the sensibility of the affected parts. Keep tightly corked, and wrap the bottle with a dark cloth or paper.

(b) In a pint bottle place a teaspoonful of chlorate of potash. Drop in a half-teaspoonful of muriatic acid, cork the bottle quickly, and shake it gently in such a way as to bring the acid well in contact with the crystals. A greenish-yellow gas will appear in the bottle. After allowing the bottle to remain closed for ten or fifteen minutes, remove the stopper and pour in quickly half a teacupful of water. Stopper the bottle again immediately and shake four or five minutes. Repeat the process until the bottle is two-thirds full. Use as strong as patient can bear without causing irritation of the mucous membrane.

(c) Dissolve in a half-pint of equal quantities of vinegar and water two heaping teaspoonfuls of common salt. Use very freely.

Lotions.—Medicated lotions of various kinds are useful for a variety of purposes, but particularly as astringents, as soothing and cleansing agents, and to neutralize morbid secretions. We mention below a few of the most approved. It will be observed that we have omitted to mention arnica, one of the most popular of all washes.

This we have purposely done, believing it to be a poisonous drug which should never be employed. We cannot better describe the dangers attendant upon its use than has been done by Dr. Farquharson in the *British Medical Journal*, from which we quote as follows:

"Of all the occasional offenders of this sort against comfort, and even life, is arnica, which is commonly resorted to by the ignorant public as a sovereign remedy for sprains. It is pretty generally recognized among medical men, no doubt, that it now and then produces erysipelatous inflammation of the skin; but book knowledge of this sort makes little impression in comparison with the observation even of a simple case. Prof. Hebra is one of the most persistent and strenuous opponents of arnica, and I well remember his vigorous denunciation of its evil effects, from the text of a very acute inflammation of both hands, for which it was responsible, and where the skin was covered with large blisters, and almost running into gangrene. A year or two ago I had the opportunity of seeing a typical case in the person of an old lady to whose sprained arm a non-professional nurse had applied a weak solution of arnica, contrary to my advice. A true erysipelas started from the point of application, and slowly spread all over the body, causing much irritation, discomfort, and depression, and greatly retarding her recovery from what would have been otherwise a comparatively trifling injury. . . My advice to you is to let this drug take its rightful place among those substances of extinct reputation which still continue to sleep peacefully in the Pharmacopœia."

Alcohol Wash.—Mix alcohol and water in the proportion of one part of alcohol to three of water. Often of service in restraining the exhausting night-sweats of the advanced stage of consumption. Also in night-sweats from other causes. The trunk of the body should be bathed with the solution night and morning. Brandy or whisky may be used instead of alcohol.

Vinegar Wash.—Use one part of strong cider vinegar and three parts of water. As vinegar evaporates more readily than pure water, this is an excellent cooling lotion for use in sponging fever patients. Vinegar and water in equal parts makes an excellent lotion for use in cleansing the feet, armpits, and other parts of the body in which the perspiration has a fetid odor.

Wash for Fetid Feet.—Another excellent wash for fetid feet is made by dissolving in half a pint of pure soft water a heaping teaspoonful of powdered sal ammoniac. Use twice a day.

Wash for Sore Mouth and Chapped Hands.—Two teaspoonfuls of chlorate of potash dissolved in half a pint of water. Wash the mouth with the solution several times a day in cases of aphthæ, or ulcerated sore mouth. For chapped hands, apply after cleansing the hands well with soft water. After applying, allow the hands to dry without wiping. Apply morning and evening. A little glycerine added to the solution adds to its utility.

Borax Wash.—Three teaspoonfuls of powdered borax, a tablespoonful of glycerine, and a large tumblerful of water. An excellent soothing lotion for inflamed or chapped surfaces. Useful in sunburn.

Wash for Hands.—Dissolve in a pint of soft water a tablespoonful of glycerine. Washing the hands with this preparation daily will keep the skin soft and prevent chapping. When the hands have become chapped, wash them with the chlorate of potash or sal ammoniac solution, and apply pure glycerine before drying the hands. Do not wipe off the glycerine.

Face Wash.—The following is an excellent wash for sunburn: Borax, one teaspoonful (powdered); glycerine, two teaspoonfuls; water, two teacupfuls. Daily washing of the face with this solution will prevent chapping, and will remove the effects of sunburn.

To Remove Tan, Clear the Skin, etc.—Both the following lotions are useful for this purpose, when daily employed: 1. Lemon juice, an ounce; powdered borax, a teaspoonful; water, four ounces. 2. Grated horse-radish root, one ounce; cold buttermilk or vinegar, three ounces; use after allowing to stand a few hours. Apply at night, and do not wash off until morning.

Lotions for Dandruff.—Borax, half a teaspoonful; soft water, four tablespoonfuls; glycerine, a teaspoonful. Wash the head well with fine soap and water, then rub on lotion with considerable friction.

Eye Washes.—A great amount of harm is done by the indiscriminate use of eye waters of various sorts. Many eyes have been destroyed by the application of lotions of an irritating character. No strong medicines of any sort should ever be applied to the eye. The organ sometimes requires the use of gentle astringent washes, but these should be used with the greatest care, and under the direction of a competent physician when possible. The following washes are very mild in character, and may be used with benefit in simple mucous inflammation of the eye, one of the most common affections of this organ: 1. Pure alum, one grain; pure soft water, two tablespoon-

fuls. Put a few drops in the eye twice a day. 2. Sulphate of zinc or white vitriol, one grain to two tablespoonfuls of soft water. 3. Strong tea, clear and cold. The value of tea is due to the tannin which it contains.

Liniments.—Liniments are useful in allaying pain and in stimulating vital action in parts in which increased activity is desired; also as a means of mild counter-irritation. The advantages afforded by liniments are nearly all possessed by the ordinary fomentation, or the fomentation alternated with the cold compress. However, there are cases in which liniments are useful, and so we give prescriptions for a few:—

Camphor Liniment.—Camphor, two tablespoonfuls; olive-oil, half a teacupful. Mix well before applying.

Ammonia Liniment.—Ammonia water, two tablespoonfuls; olive-oil, four tablespoonfuls. Specially useful in lumbago and stiff neck.

Lime Liniment.—Mix equal parts of lime-water and flax-seed oil. Olive-oil will answer equally well. An excellent application for use in the latter stages of eruptive diseases. It is said to prevent pitting in small-pox if the surface is kept smeared with it.

Chloroform Liniment.—Mix one part of chloroform with two parts of olive-oil. Apply to relieve pain, as to sprained joints.

Numerous other combinations might be given, but these will suffice for most purposes in which liniments are useful. In their application it should be borne in mind that a large share of the benefit derived from remedies of this sort must be attributed to the rubbing which accompanies their application. Hence they should be "well rubbed in," and should generally be applied warm, especially when intended to relieve pain or promote absorption.

Unguents, or Ointments.—The uses of ointments are similar to those of liniments. They are often of great value in allaying irritation, and also in applying medicaments to the skin in parasitic and other cutaneous diseases. We give a few prescriptions only, as others will be given in connection with the description of the conditions for which they may be usefully employed.

Vaseline Ointment.—This consists of pure vaseline, which is a product obtained from petroleum. It may be used pure or slightly scented with rose or other agreeable perfume, or used as the basis for any medicated unguent, the application of which is desired. Vase-

line is of about the consistency of lard. When pure, it is odorless and tasteless. It is practically identical with what is sold as cosmoline, which is obtained from the same source, but is not so wholly free from odor. It may be rendered sufficiently firm for any use as an unguent by the addition of a very small proportion of wax or of paraffine. Used pure, vaseline is an admirable agent for inunctions. For this use, most prefer it without perfume. It is far superior to what is sold for olive-oil, which is, in fact, chiefly composed of lard oil or cotton-seed oil.

Cocoanut Oil.—A year or two ago we obtained a specimen of refined Canton cocoanut oil, with which we experimented in giving inunctions. The result was so satisfactory that we have since employed this fine unguent. It is much finer than vaseline, or than any other vegetable oil with which we are acquainted. Its faint nutty odor is to most persons agreeable, rather than otherwise, and its greater fluidity at the temperature of the body facilitates its application. It becomes rancid when kept in a warm place, and hence should be kept as cool as possible. It keeps better when covered with lime-water.

Carbolic Acid Ointment.—A mild ointment is made by adding to two tablespoonfuls of vaseline ten drops of pure carbolic acid. The acid should be very thoroughly mixed with the vaseline, otherwise it will cause painful burns. If the odor is unpleasant, it may be hidden by some agreeable perfume, as rose or bergamot. This is an excellent application for the relief of burns. It also affords great relief from the irritation of prurigo. May also be used with success in the treatment of parasitic diseases of the skin, when they are confined to a limited area; but it should not be applied to the whole body at the same time, as poisonous effects have occurred from its absorption when used in this way.

Itch Ointments.—The best remedy for *scabies* is sulphur, and hence most itch-ointments contain this ingredient. Its only faults are its marked and unpleasant odor and its irritating properties. The first may in some considerable degree be obviated by such perfumes as bergamot and sandal-wood oil, and the second by using the finest precipitated sulphur instead of ordinary powdered brimstone. The following are some of the most reliable ointments in use:—

No. 1. Flowers of sulphur, a tablespoonful; lard or vaseline, three tablespoonfuls; fifteen drops of oil of bergamot, or a sufficient amount of oil of sandal-wood.

No. 2. Add to each tablespoonful of the above mixture, half a teaspoonful of finely powdered iodide of potash.

No. 3. Flowers of sulphur, a teaspoonful; balsam of Peru, a teaspoonful; vaseline or lard, two tablespoonfuls. This is a milder ointment, and hence better adapted to children and persons with sensitive skins.

No. 4. Liquid styrax, a tablespoonful; vaseline or lard, two tablespoonfuls; melt and strain. A very mild ointment, the smell of which is not at all unpleasant.

No. 5. A favorite preparation at one of the Paris hospitals is the following: Carbonate of potash (saleratus), a teaspoonful; flowers of sulphur, two teaspoonfuls; vaseline, three tablespoonfuls. This is said to cure with one application after a thorough bath.

Ointment for Sunburn.—Spermaceti and almond oil, each, two tablespoonfuls; honey, half a teaspoonful. Scent with attar of roses. Apply at night.

Inhalations.—The treatment of diseases of the throat and lungs by means of the inhalation of remedies has already been referred to. There seems to be no reason why medicaments should not be applied to the mucous membrane as well as to the skin, as the two structures are so closely allied, and the diseases by which they are affected in many respects similar. It has been shown that by means of the inhalation of medicated vapors or of substances in a state of minute subdivision, such as is produced by the atomizer, remedies may be conveyed to the remotest air-cells of the lungs. It is evident, then, that if there are remedies which may be usefully employed in the treatment of the mucous membrane of the mouth, the same remedies ought to be of service in the treatment of allied diseases of the lungs. Experience shows this to be the case. Even the inhalation of vapor alone is very useful in some diseased conditions of the pulmonary mucous membrane. We have seen a dry, irritable cough relieved as if by magic by breathing deeply a few times in an atmosphere charged with watery vapor, or taking a few breaths of the atomized spray. Still greater relief may be secured by the combination with the watery vapor of emollient substances, or, in severe cases, anodynes. In pulmonary hemorrhage, the inhalation of a styptic fluid furnishes the most certain means of checking the loss of blood. By similar means, profuse secretion may be checked, and other morbid conditions corrected.

As just intimated, inhalations are administered by two methods;

viz., by the inhalation of volatile substances mingled with the vapor of water, and by the means of atomization of liquids. The first method is by far the simpler, but is of course far more limited in its application. An inhaler can be easily improvised by inverting a funnel over a vessel containing the substance to be inhaled, upon which a quantity of boiling water has been poured. By placing the mouth at the small end of the funnel the vapor may be drawn into the lungs. The breath should always be exhaled, or breathed out, through the nose. In case a funnel of proper size is not at hand, one may be constructed of stiff paper which will answer the purpose admirably. A tea or coffee pot may also be used with entire success if care is taken not to use too much of the solution. When the inhalation is to be

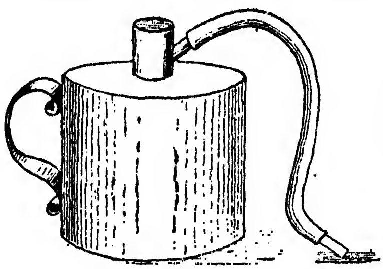


Fig. 273.

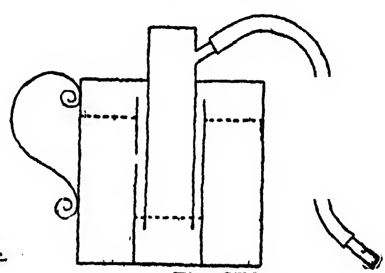


Fig. 274.

taken for a long time, as in croup and diphtheria, two inhalers may be used, or the inhaler may be placed over a lamp on a stand at the bedside and the vapor conducted to the mouth by means of a large rubber tube. It is wise to have on hand an inhaler which has been made for the purpose, as much trouble will thereby be saved, and the treatment can be much more efficiently given. Such an apparatus, which we have had made and have for some time used, is represented in Figs. 273 and 274, which will be easily understood.

A steam atomizer may be made to do duty in giving a fomentation or a local vapor bath, by removing the atomizing tube and replacing it by a glass tube connected with a rubber tube of proper length by means of which the steam can be conducted to the spot where it is needed, the other end of the tube being inclosed in a woolen cloth when a fomentation is required. By enveloping a patient in blankets, placing objects under the blankets so as to elevate them slightly from his body, and conducting the vapor from the atomizer underneath the blankets, a vapor bath may be administered to a patient in bed. Care

must be taken to protect the patient and the bedding from the condensed water which drips from the end of the rubber tube. The tube should be of considerable size, so that the steam may not be impeded.

The following are the most useful agents employed by inhalation :—

Oxygen.— As elsewhere remarked, this gas has been used to a considerable extent in the treatment of various diseases, and with a considerable degree of success. It is usually inhaled from a gas-bag or cylinder from which the supply can be properly regulated. This agent has proved to be very useful in asphyxia from drowning, from the inhalation of some irrespirable gas, or the inhalation of chloroform, and in pneumonia. The inhalation of compressed air has to some extent the same effect as the inhalation of oxygen. The inhalation of compressed air requires complicated and expensive apparatus, and has seldom been employed in this country in a way to secure genuine curative effects. In the apparatus in use here, no suitable provision being made for ventilation, the effects of a dense atmosphere have been negatived by the simultaneous inhalation of the poisonous products of respiration.

Ozone.— This powerful agent is oxygen in an active state, as elsewhere stated. It exists normally in the atmosphere at certain times, but in so small quantities as to be unappreciable to the senses. It has been shown to be useful in the treatment of various affections, and especially in the class of affections for which oxygen has been successfully used. There is probably no other agent so useful in correcting the fetor of the breath, which is usually present in advanced stages of consumption and in ulceration of the larynx, trachea, and nasal cavity. Ozone may be generated artificially by means of an electrical current passed through a proper apparatus. The writer has devised a simple ozone generator which produces a current amply sufficient for medical purposes. Being very irritating, it can be inhaled only in exceedingly minute quantities.

Water.—As before explained, the vapor of water is the vehicle most commonly employed for the inhalation of vapors of volatile substances used in this way. Water is necessary also in the inhalation of substances by means of the atomizer. In the use of both of these methods, not a small share of the results obtained is justly attributable to the effects of water, independent of the other agents employed. It has been shown that warm vapor is exceedingly useful in allaying irritability of the mucous membrane in asthma, chronic bronchitis, pharyn-

geal inflammation, etc. Vapor can be produced for inhalation by the ordinary vaporizing apparatus, or by any of the simple plans already mentioned. When its continuous use is necessary, however, or it is desired to impregnate the whole atmosphere of a room with warm vapor, it can be readily done by placing upon the stove, in the apartment, a large wash-boiler partly filled with water and containing one or two large sheets; when the water is boiling well, large quantities of vapor can be repeatedly produced by raising the sheets out of the water, as is frequently done in washing. Vapor may also be generated with great rapidity, and in close proximity to the patient, by placing in a pail or tub several bricks, stones, or other objects, heated quite hot, and pouring upon them boiling water. By the use of a large number of hot bricks, vaporization can be kept up in this way for any length of time.

Vinegar.—The inhalation of vapor from a mixture of water and vinegar will often be found very grateful to patients suffering with an irritable condition of the air-passages. It is useful in diphtheria, having a considerable influence in loosening the false membrane.

Lime.—It is not, of course, possible to vaporize lime for purposes of inhalation, but in slaking freshly burned lime by pouring hot water upon it a very violent action will ensue, by means of which the vapor thrown off will be laden with very fine particles of lime, which may thus be inhaled and brought in immediate contact with the mucous membrane of the throat. Used in this way, lime is a most excellent agent for dissolving false membranes which are formed in the throat and larynx in diphtheria and croup. The method of using is very simple. The lime may be slaked in a copper pot, and inhaled from the spout, or it may be placed in a saucer, and held near the patient's nose, while both head and saucer are covered with a blanket. The better plan is to cover the vessel containing the lime with a funnel made of stiff paper, the nose of the patient being placed at the upper end of the funnel. A stiff paper bag answers a very good purpose. The mouth of the bag should be placed over the vessel containing lime, and the patient's mouth and nose placed within the opening made by cutting off one of the corners of the diagonal. Dr. Austin Flint, of New York, in cases of croup places the patient in a small room, taking care to secure good ventilation of course, and places beside the bed, as near the patient as possible, a large tub in which lime is kept constantly slaking. By this means the air of the room is continually filled with warm vapor, and is also charged with lime particles. Cures have been effected by

this means where all other remedies had proven ineffectual and the case was considered hopeless. Lime-water may be also used with the atomizer. The proper strength to employ is one part saturated lime-water to one or two parts of water. This remedy is especially useful in the treatment of diphtheria for the purpose of facilitating separation of the false membrane.

Carbolic Acid.—For the inhalation of the vapor of carbolic acid, make a solution of the acid in equal parts of lime and water in the proportion of half a teaspoonful of pure carbolic acid to an ounce of glycerine; of this, add one teaspoonful to a half pint of boiling water. For use with the atomizer, a solution may be made as follows: One teaspoonful of glycerine; two tablespoonfuls of water; three drops of pure carbolic acid. Shake thoroughly before using. Carbolic acid is of great service in the treatment of diphtheria, and is also very useful in the advanced stages of consumption, when the expectoration is of an offensive character, and the breath strongly fetid. It is also of service in all diseases of the air passages in which the breath is offensive.

Balsam of Tolu.—To a large tumblerful of boiling water, add a teaspoonful of balsam of Tolu. This is a very pleasant and soothing remedy. Use with the vapor inhaler.

The following preparations are all to be used with the atomizer:—

Glycerine.—Mix one part of glycerine with five to ten parts of water. This makes a soothing application for use in croup, ulceration of the larynx, and acute inflammation of the throat.

Glycerine and Tannin.—Mix as much tannin as can be heaped on a silver dime with a tablespoonful of glycerine. When it is well dissolved, add two tablespoonfuls of water, shake well, and if there is any sediment in the solution, filter before using. A good application for use in chronic pharyngitis, and also in the early stage of acute inflammation of the throat.

Gum Arabic.—Dissolve in two tablespoonfuls of water, half a scruple to a scruple of gum arabic. Filter if the solution is not clear.

Salt.—Common salt is of especial service in the treatment of what is termed dry catarrh of the throat and bronchia; it may be used in varying proportions according to the effect, as from a small pinch of salt dissolved in two tablespoonfuls of water to two-thirds of a teaspoonful in the same amount of water.

Chlorinated Soda.—The solution should consist of from ten drops to half a teaspoonful of chlorinated soda to two tablespoonfuls of water. It is excellent to correct fetid breath. The undiluted solution of chlorinated soda is of great service in disinfecting the air of sick-rooms. The atomizer should be carried into all parts of the room, so that the whole air may be washed with spray.

Permanganate of Potash.—The strength of the solution should be from one to ten grains dissolved in two tablespoonfuls of water. Useful in diphtheria, sore mouth, ulcerated sore throat, and in all cases of fetid breath.

Tar.—In cases of advanced consumption in which there is very offensive expectoration which is raised with difficulty, great relief is often afforded by the inhalation of the spray of tar. The solution should be a teaspoonful of purified tar to an ounce of hot water. The quantity of fluid inhaled in spray, when used in the treatment of chronic cases, should be about one ounce once or twice a day. In acute cases, the application may be made three or four times a day. In diphtheria and croup it is often necessary that the inhalation should be made almost constantly for some hours at a time, or, if too fatiguing to the patient when applied continuously, it should be repeated at intervals of half an hour or so, or whenever there is any difficulty in respiration. When the spray or vapor inhaled is quite warm, the patient should not expose himself by inhaling cold air for half an hour or an hour after receiving treatment.

Adhesive Plasters.—There are many cases in which adhesive plasters are of very great service, especially in surgery, in which they are most often used for holding cut or wounded parts together until they are knit together by the repairing efforts of nature. Plasters are also useful for confining a part which is the seat of disease, as in pleurisy, in which the extreme suffering of the patient will often be relieved by the application of strips of adhesive plaster to the affected side. Great relief is often received in lumbago and neuralgia by wearing plasters over the affected parts, by which means the action of the muscles is, to a great degree, restrained, thus preventing irritation. Isinglass plaster is one of the most commonly employed in surgery, though a newly invented rubber plaster is rapidly taking its place on account of its much greater strength and durability. We employ the latter almost altogether for surgical purposes. Plaster made from pitch is very often used for the relief of lumbago. Burgundy pitch is often used in the form of plaster as a mild counter-irritant.

Decoctions.—Decoctions of various sorts are much used by the common people in the home treatment of diseases. They are also a favorite remedy with most barbarous tribes. They are made from seeds, roots, barks, and in fact all the different parts of plants. Some decoctions, as those of juniper berries, wormwood, and cherry bark, contain very powerful medicinal properties, but the great majority of domestic remedies of this sort contain scarcely any property, except the nauseous taste, in addition to those of the water of which they are largely composed. The success of domestic remedies is largely due to this fact, the patient, by the use of some simple or harmless "tea," being prevented from using remedies which might be positively harmful. Hot drinks flavored with peppermint, sassafras, wintergreen, or almost any one of a great variety of substances used for teas, are often of great service in encouraging activity of the skin in conditions of the system in which powerful elimination is required.

Blackberry-Root Tea.—To three pints of water, add two heaping tablespoonfuls of small blackberry roots; or the bark of larger roots may be used. A tablespoonful of this may be used three or four times a day in cases of diarrhea and dysentery in which the results desired are not secured by other remedies, which is seldom the case. The remedy is harmless, and often does some good by means of its astringent effects.

Tea of White-Oak Bark.—Take two tablespoonfuls of well bruised white-oak bark. Boil for half an hour in a pint of water. Then add enough water to make up for what has boiled away, and strain. This may be used in the same conditions as the decoction of blackberry root.

Tooth Powders.—Every person should keep constantly on hand a supply of powder for cleansing the teeth. Great care, however, should be taken in purchasing the powders which are sold at the drug-stores, as many of them contain deleterious substances. One of these is powdered pumice-stone, which cleanses the teeth very rapidly at the expense of the enamel. No powder should be used which contains any gritty substance. Even powdered charcoal, which has been much employed in cleaning teeth, has been objected to by experienced dentists, who claim that the fine particles of charcoal work down between the teeth and gums, and cause separation of the gums from the teeth. As good a powder for practical purposes as can be produced anywhere can be made by mixing precipitated chalk and carbonate of magnesia in the proportion of two tablespoonfuls of the chalk to a heaping teaspoonful of mag-

nesia. Flavor with cinnamon, wintergreen, peppermint, or any other agreeable flavor. Pulverized chalk should not be used, as it is gritty. Care should also be taken to avoid purchasing the prepared chalk which is sold by druggists as a cosmetic. An excellent powder may also be made by mixing precipitate of chalk with oris root and other harmless substances. None, however, are especially superior to that made by the formula given.

Medicated Baths.—Various substances are frequently added to water baths for the purpose of producing some particular effect, as to soothe an irritated skin, to soften thickened epidermis, to destroy parasites, etc. The following are a few of the most useful baths of this sort :—

Bran Bath.—Steep a quart of bran in two or three quarts of water for an hour, then simmer for half an hour. Strain, and use the water for a sponge bath. When the full bath is desired, a much larger quantity of bran may be used and the water obtained from it added to the bath. This application is especially useful in acute eczema and other irritable conditions of the skin.

Gelatine Bath.—If a full bath, soak a pound of gelatine in two quarts of water for an hour or two, or until well softened. Then heat until melted. It should be stirred in before it is allowed to cool. The indications are the same as for the bran bath.

Alkaline Bath.—Dissolve in the water for the full bath a quarter of a pound of carbonate of soda or ordinary baking-powder. Saleratus may be used if soda is not convenient. This bath will often give great relief to the severe burning and itching of eczema. It is also an excellent means for softening epidermis when it is thickened by disease.

Soap Bath.—Dissolve a pound or two of white soap in five or six quarts of hot water. This is sufficient for a full bath. For some cases, as the preparatory bath for the treatment of itch, ordinary soft-soap is better than white soap.

Salt Bath.—Add one to five pounds of salt to the water of a full bath. The effect of this bath is very much the same as that of a sea bath. It excites the skin somewhat more than ordinary water.

Mustard Bath.—The mustard bath is sometimes employed when it is necessary to excite great activity of the skin in a short time. We have never found occasion for using it, however, as we have been able to obtain the effect desired by regulating the temperature of the bath. It

is administered by adding two or three ounces of mustard to the water of the bath.

Medicated Fomentations.—When an intense effect is desired through the application of fomentations, the ordinary effects may be increased by the addition of mustard to the water in which the flannels are wet. Turpentine is also sometimes used, but we have never found reason for applying it. The usual plan is to wring out the cloths and sprinkle on a few drops of turpentine just before applying to the skin. Salt water is frequently used for fomentations with the idea of increasing the stimulating effect, which it may do to some degree.

Sulpho-Vapor Bath.—This bath is administered by burning a small quantity of sulphur in the vapor-box while the vapor bath is being administered. Care should be taken to close the box tightly and to protect the patient's mouth and nostrils from the fumes of the burning sulphur by closing the space about his neck with a towel. The sulpho-vapor bath is a very efficient means for destroying parasites of the skin. It has been highly recommended in rheumatism, though we have never been able to discover any effects which were not as readily obtained through the vapor bath alone.

Glycerine Bath.—Soak one-half ounce of gum tragacanth in a pint of water, add an ounce of glycerine, and boil. Then add four gallons of water of proper temperature, and the bath is ready. Very excellent indeed in some forms of skin disease, particularly those of an irritable character.

Salt-Rubbing Bath.—This consists in rubbing the whole surface with common salt, the skin having first been moistened by a wet-hand rub, sponge bath, or other water bath. The effect is to excite vigorous action of the skin. This bath is indicated in all cases in which there is marked debility with inactivity of the skin. It is not probable that any special effect is produced by the slight quantity of salt which is absorbed. The results obtained by the bath are undoubtedly attributable to the local effects of the salt and the rubbing upon the skin.

The Hot-Air and Vapor Douche.—We have devised an apparatus for the application of vapor and hot air in the form of the douche, but have not yet had the opportunity of experimenting with their effects, but hope to find them applicable to a certain class of

cases in which the excessive sensitiveness of the surface forbids the use of hot fomentations or hot bags.

Lime-Water.—Place a piece of clean, freshly burned lime in a two-quart glass fruit-can. Pour in water sufficient to nearly fill the can. After allowing the lime to slake for an hour or two, shake the contents of the can thoroughly and allow to settle until clear. Keep the can covered. The lime-water may be turned off from the sediment, or it may be drawn off by means of a syphon. Dilute with one to three parts of water or milk when taken internally. May be used alone with the atomizer in cases of diphtheria.

To Remove Stains Produced by Nitrate of Silver and Iodine.—Stains produced by nitrate of silver or iodine are very persistent, and as they are frequently produced on the hands and clothing in their use in medicine and surgery, it may not be improper to mention the best methods for removing them.

1. To remove nitrate of silver stains, wash the stains in a strong solution of iodide of potash, or moisten with a weak alcoholic solution of iodine, and wash immediately with ammonia water.

2. To remove nitrate of silver stains from linen, use a strong solution of cyanide of potash to which a few drops of the tincture of iodine has been added just before using. It should be remembered that cyanide of potash is a powerful poison which produces speedy death when swallowed. When employed for the purpose named, it should be kept in a closely stoppered bottle, and labled "poison."

3. To remove iodine stains, wash in a strong solution of hypo-sulphite of soda, and rinse thoroughly with water.

DISEASES AND THEIR TREATMENT.

The definition of disease we have elsewhere given as being a derangement of the structure or functions of the body. Strictly speaking, any degree of derangement is a diseased condition, although such states are not usually called disease unless the departure from the condition of health is so great as to occasion considerable inconvenience in the way of suffering or danger to life. All modern physiologists agree in this view, although a large share of medical works still retain forms of expression which embody erroneous ideas of disease. In common parlance the term disease is often applied to conditions which are merely symptoms, as dropsy, vomiting, etc., and for the convenience of the reader we shall in this work consider symptoms of this sort in the usual manner; since they require special treatment, and are often the most prominent manifestation of the morbid conditions by which they are produced.

Although there are a great number of individual diseases and morbid conditions, 1,147 different diseases and injuries to which the human body is liable being enumerated in the list prepared by the Royal College of Physicians of London, a careful study of all these different morbid states reveals the fact that the same principle holds good in reference to diseases as in reference to the various organs and numerous parts of the body; namely, that while there are a great variety of individual forms, there are in fact but a very few primary morbid conditions. The nature of these primary diseases or morbid conditions is by no means so well known as is the minute structure of the anatomical elements of the body, and yet sufficient is known to enable us to greatly simplify our ideas of the nature and proper treatment of disease through an understanding of its simplest elements. In order to give the intelligent reader a better idea of the nature of disease in general, we will briefly consider, before passing to a description of individual diseases, what has been termed the constituent elements of disease or constituent diseases under the two heads, structural derangements and functional derangements.

STRUCTURAL DERANGEMENTS.

It may well be doubted whether there can be any distinct manifestation of disease without a greater or less degree of derangement of the structure of organic parts, since function is wholly dependent on structure. For the sake of convenience, we may consider as structural derangements such diseased conditions as involve changes in the tissues of the body to such an extent as to render them perceptible by the senses. Under this head we will first notice—

Morbid Conditions of the Blood and Other Fluids.—Changes in the blood are not usually considered as organic or structural in character; but, as we have previously seen, the blood is really a fluid tissue, and changes in it embody more or less modification of the character of its constituent elements, as do changes in solid parts. Hence, it appears to us to be perfectly proper to class under this head morbid conditions of this sort. Diseased conditions of the blood are produced in a variety of ways. Perhaps the most frequent means by which the blood becomes diseased is by a retention of the waste products, or excrementitious elements, of the system, which are naturally eliminated as rapidly as produced. The nature of these various elements we have already elsewhere explained (see pp. 300–315), and so need only remark that the most important are the following: *Uric acid*, or *urea*, a poisonous element eliminated by the kidneys; *cholesterine*, and other poisonous elements of the bile, eliminated by the liver; *carbonic acid*, eliminated by the lungs; and a variety of poisonous elements eliminated by the skin and by the mucous membrane of the alimentary canal. When the function of any one of these great outlets of the system is suspended, the poisonous elements which it is designed to remove accumulate in the vital fluid, and occasion symptoms of poisoning to a greater or less degree. This morbid condition is present in a large share of all general diseases, and is, indeed, one of the most common predisposing causes of disease. The blood may also become diseased by the absorption of poisons from without, as by the reception of poisonous gases, disease germs, and poisonous substances in solution in drinking-water, or taken in conjunction with the food. It is also through the blood that the morbid elements of contagious diseases penetrate the system.

Another mode by which the blood becomes diseased is by a change in the proportion of its constituent elements, by which it becomes unable

to perform its functions properly. These changes may consist in an increase or decrease in the proportion of fibrine, of albumen, of water, of salts, of the white globules, or of the red corpuscles. Each of the changes indicated is attended by its particular class of symptoms When fibrine becomes too abundant, the blood is likely to coagulate in the vessels, forming clots. When it is deficient, the fluidity of the blood becomes so great that severe hemorrhage may result from a very slight wound, or the blood may even ooze through the thin coverings in certain parts of the body, particularly the mucous membrane of the lungs. Deficiency of albumen renders the blood inefficient to support the nutritive processes of the body. When it is too abundant in consequence of overfeeding, the blood becomes too highly charged with nutritive elements, producing feverishness, and even inflammation. This is known as *plethora*, the opposite of which is *anemia* When the fluid portion of the blood is too abundant, as it may become from drinking excessive quantities of fluids, injury may be occasioned by the excessive fullness of the blood-vessels. In the opposite condition the blood becomes thick, and is circulated with difficulty. A deficiency in the number of red corpuscles, a condition usual in debility and deficient nutrition, is usually accompanied with deficient oxygenation of the blood, a function which is chiefly performed by the red corpuscles. This condition is one of the characteristics of anemia. An excessive proportion of white blood corpuscles is also attended by serious interference with the vital functions.

In consequence of these changes in the blood, morbid conditions are produced in all the other fluids, whether secretions or excretions. If the blood contains retained or absorbed poisons, every fluid secretion and excretion will be contaminated with the same. If it is deficient in nutritive elements, the various vital fluids essential to the maintenance of life will also be deficient in the particular elements by which they are characterized, which are derived from the blood. And not only the fluids, but also the solids of the body, must be affected by changes in the blood, since the solids are all produced from the blood.

Diseased Conditions of the Solid Structures of the Body.—The diseased conditions of the solid structures of the body, which are readily appreciable by the senses, are of two classes: First, those which are due to mechanical and chemical causes; and, second, those which result from abnormal vital action. The latter class may not be in the

strictest sense primary diseased conditions, as little is known of the morbid vital action from which they result, but they may, for the present, be so considered.

Under the first head may be included all kinds of surgical accidents, bruises, fractures, etc.; injuries from chemical agents, as burns, injuries from caustics, or from irritating and corroding gases; the effects of gravitation, as in congestion of the lungs resulting from the accumulation of blood in the lower part in certain weak states of the system when the patient lies continually on the back; the production of varicose veins in the lower extremities from long standing or walking; the effects of mechanical obstruction to the circulation, as from wearing garters, and tight-lacing, also from the pressure on the blood-vessels of enlarged glands and tumors of various sorts; the results of obstruction of the ducts of glands, as in obstruction of the biliary ducts; the results of interference with respiration, occasioned by mechanical obstruction of the trachea or œsophagus, or from pressure on the chest by tight-lacing, or malposition of the body.

Under the second class, that is, structural derangements due to abnormal vital action of various parts of the body, we may mention the following: Changes in the size of the organs, changes in their consistency, exudations, transudations, degenerations, morbid growths. On account of the narrow limits of our space, we can delay but briefly on these various morbid changes, which of themselves furnish material for many large volumes. We must, however, hastily glance at a few of the most important. The changes in size of the organs are, of course, but two,—increase and diminution. Increase in size is termed *hypertrophy.* It is said to be either true or false, as the increase in size is due to the actual increased growth of the proper tissue of the organ, or to a mere expansion of volume without any actual increased growth of the tissue; as, for example, in hypertrophy of the heart we have sometimes an increase of size due to the increased growth of the heart's muscle, and at other times we have an increase in the size which is due to simple dilatation of its cavities and thinning of its walls without any actual increase in substance. In the majority of cases it happens that both forms of hypertrophy are present at once. Diminution in size is known as *atrophy.* In true atrophy there is a decrease in proper tissue. This may be accompanied either with an increase or decrease of size, since in some cases in which loss of proper tissue occurs, there is at the same time a great increase of size

from the deposit of abnormal or adventitious tissue, the latter process being, in fact, in many cases the real cause of the atrophy.

Changes in consistency consist of hardening or softening. These changes may take place either with or without inflammation.

Certain fluids, when thrown out into the cavities of the body, or deposited in the interstitial spaces of the tissues, become solid or semi-solid. These are termed *exudations*, in contradistinction from fluids, which, thrown out or deposited in this manner, remain in a fluid state, and are termed *transudations*. Exudation is a very common result of inflammation. Another solid or semi-solid deposit, which may be called an exudation, is tubercle, a characteristic product of consumption, or tuberculosis. Tubercles are said to be of two kinds,—the small gray tubercle, and larger yellowish masses of a cheesy consistency, called yellow tubercle.

There has been much discussion among pathologists as to which is the true tubercle. Probably the most correct view is that the two are simply different stages of the same morbid product, the gray tubercle after a time being converted into a yellow tubercle. More will be said on this subject in connection with the description of consumption. The peculiar deposit which takes place in a scrofulous enlargement of the glands, somewhat resembling tubercle, is also an exudation. Transudations give rise to dropsy or chlorosis, the former when the fluid collects within the closed cavities, the latter when the escaping fluid is discharged from the body.

Degenerations and morbid growths of various sorts are changes in the structure of organs resulting from mal-nutrition, which is probably due to a depressed condition of the vitality of the parts in which these changes occur. Under the head of degenerations is included what is known as fatty degeneration, in which the normal tissue of a part is changed to fat, as in fatty degenerations in the nervous system or in the muscular tissue of the liver, kidneys, heart walls, blood-vessels, and, in fact, almost all the organs of the body. In some cases the proper tissue is absorbed, and a chalk deposit made in its place. This is known as calcareous degeneration, and frequently succeeds fatty degeneration. A peculiar form of degeneration of the liver, kidneys, and spleen, has been observed, in which the normal tissue of these organs resembles wax. This is known as waxy or lardaceous degeneration. Under the head of morbid growths are included various forms of cancer, fibrous tumors, and allied growths of a morbid character.

FUNCTIONAL DERANGEMENTS.

Functional derangements of a primary character may be enumerated as irritation, inflammation, congestion, depression, and fever.

Irritation is a condition in which there is an abnormally increased activity in a part, due to morbid excitation caused by some abnormal influence, mechanical, chemical, or physical.

Congestion is a condition of a part or organ in which the small blood-vessels contain an unnatural quantity of blood. There are two forms, active and passive. In active congestion there is abnormal activity of the circulation, which is the result of irritation or unnatural excitement of the vital activities of a part. In passive congestion there is no increase in the amount of blood circulating through the part. In fact, the amount of blood actually passing through its blood-vessels may be diminished. The condition is one in which from some obstruction to the circulation the venous blood does not pass onward as rapidly as it should, and hence accumulates. The accumulation may be the result of mechanical obstruction of the circulation or deficiency in the vital activity of the tissues. Passive congestion is always accompanied with a depressed condition of the affected part. The results of congestion depend on the nature of the organ affected. Whether active or passive, it always causes a decided disturbance of the functions of the part. If a secreting or excreting organ is affected, the natural product may be increased or diminished according to the intensity and character of the congestion. Congestion, both active and passive, is often accompanied with pain. The pain of active congestion is much more acute than that of passive congestion. Active congestion is of short duration, as if long continued it passes into inflammation or passive congestion.

Inflammation is a morbid condition, the symptoms of which are usually described as being heat, pain, redness, and swelling. It should be mentioned, however, that the symptoms given are not the real disease. Inflammation itself is undoubtedly only an advanced stage of the condition before described as irritation. When irritation becomes intense or is sufficiently long continued, certain changes in the tissues occur which are recognized as inflammation. One of the first and most characteristic symptoms is an increase in the number of white blood corpuscles in the part subject to the morbid process. The heat, pain, redness, and swelling are for the most part due to the

increased blood supply, although no doubt a portion of the increased amount of heat is caused by the abnormal activity of the tissues of the diseased part. The results of inflammation, like those of depression, depend in some degree upon the part affected. As we shall mention in particular the inflammation of various parts of the body, we need not dwell further upon the subject here.

Depression, either local or general, is a condition in which there is deficient vital activity. It may be the result of a deficient supply of the natural agents upon which the system depends for support, as heat, light, electricity, food, and pure air, or it may be the result of too intense and prolonged activity, or the influence of some noxious agent upon the system, as powerful poisons. It is always present in anemia and all forms of debility. It is probable also that various degenerations previously described, and probably also morbid growths, as well as tubercles, are due to depression, since it is observed that these morbid conditions almost universally occur in connection with conditions of general or local debility.

Fever is a morbid process somewhat difficult to describe. It is perhaps hardly primary in character, since it may include all the other functional derangements mentioned. Fever is always characterized by an elevation of temperature, a change in the frequency and force of the pulse, and a disturbance in greater or less degree of the functions of every organ of the body. The various minor symptoms of fever will be noticed elsewhere, and the peculiar characteristics of the various individual fevers will be given in connection with their description.

CAUSES OF DISEASE.

In preceding portions of this work we have dwelt so fully upon the relations of air, water, food, heat, light, electricity, and various other external agents, together with the influence of habits, to the human system in health and disease, that for our present purpose we have only to summarize the foregoing statements. The principal causes of disease may be classified as follows:—

1. Abnormal conditions of the surroundings or of the relations of external agents to the human body. This class, of course, will include all errors and abnormal conditions pointed out under the head of hygiene of food and diet, hygiene of the air, and the relations of heat, light, and electricity to the body.

2. Injurious habits, which may be made to include some of the preceding, though the term is here used with particular reference to the abnormal use of various organs of the body, as excessive or deficient exercise of the nervous system, muscles, or of other parts of the body, deficient mastication of food, etc.

3. Accidents. This class may in one sense be considered as included under the first, but the term is here employed in the ordinary sense, it being intended to include in this class all kinds of surgical accidents and injuries.

In many cases, poisons in the blood, arising either from retained excretions or by absorption from without, are the source of disease; but cases of this sort are so manifestly a result of the operation of the causes mentioned in the preceding classes that they cannot be mentioned as a separate class.

Auto-Intoxication.— Modern investigations relating to the life history of the various microbes which invade the body, demonstrate the fact that one of the most important sources of poisons is the change in the vital fluids effected by these microscopic forms of life growing in the stomach and other portions of the alimentary canal, and that they produce, in connection with the processes of fermentation, poisonous substances which, when absorbed into the blood and distributed through the body, often give rise to a great variety of disturbing symptoms. In infectious diseases of various sorts, a great majority of the symptoms present are due to poisons of this character. This is true of the fever of typhoid, of the febrile action, the chill and the sweating of ague, the hectic flush and the night sweats of consumption, and the characteristic symptoms of various maladies. We will now call attention to what may be most properly denominated—

Predisposing Causes of Disease.—As just remarked, any one of the causes or the classes of causes already mentioned may produce a condition of the system predisposing it to disease; but the causes which may, under all circumstances, act as predisposing causes, and are never other than predisposing in character, are those which arise from temperament, sex, age, idiosyncrasy, hereditary tendencies, climate, occupation, modes of life, etc. Of the various predisposing causes mentioned, probably the most powerful and inveterate in its tendency of all is heredity. The actual transmission of disease by heredity occurs only in very exceptional instances. The majority of cases of so-called inheritance of disease are simply cases in which the tendency or predisposition to dis-

ease has been inherited, the nature of which is simply a weakness or deficiency of vitality on the part of some portion of the organism.

SYMPTOMS OF DISEASE.

We have not space here to enter upon a lengthy consideration of the classes of symptoms by which disease is characterized; and it is unnecessary to do so, as we have provided in the concluding portion of this work an ample and thoroughly classified index of symptoms, by reference to which the identification of diseases will be greatly facilitated and in ordinary cases rendered easy, even for those who are wholly unversed in medical technicalities. It should be remarked, however, that symptoms are the language of disease. In health, all the various vital processes are performed easily and regularly, and some of the more important, as the circulation of the blood, digestion, assimilation, and excretion, are performed unconsciously. Whenever the performance of the function of an organ which does its work unperceived by the senses during health becomes sensible, even though scarcely perceptible, we have one of the first evidences of disease. In order to understand the significance and importance of the various symptoms of disease, it is necessary that we should be familiar with the functions, structure, and appearance of the various parts of the body during health; hence the importance of a knowledge of anatomy and physiology in relation to the study of the treatment of disease. The language of health has already been well considered in the sections devoted to physiology. The language of disease, or symptomology, as it relates to the various classes of disease and individual diseases, will be explained in connection with the description of various classes of morbid conditions and individual diseases which will follow.

DIAGNOSIS.

Diagnosis is simply ascertaining the nature of a morbid condition or disease under which a person may be suffering, by an examination of the symptoms present in the case. Diagnosis is by far the most difficult part of the practice of medicine. It is in this department chiefly that medicine derives great advantages from the collateral sciences, and it is chiefly in its relations to diagnosis that medicine may itself lay claim to being a science. The practice of medicine is certainly nothing more than an art, and a not very highly developed art at that. In difficult cases, the process of diagnosis requires of the medical practitioner the applica-

tion of all he has been able to learn by the most thorough and careful research, and, frequently, his own deepest personal insight into the nature and phenomena attending the manifestation of disease in its great diversity of forms. It will not be expected, of course, that every person can be made, even by the most useful helps, a skillful diagnostitian, and on this account, perhaps, all medical knowledge can never do away with the necessity for a skillful physician. In a large proportion of cases the most important work for the physician to do is to make a diagnosis, thus ascertaining what is the real condition of the patient, and, from this, reasoning back to a discovery of the causes of the diseased state, by the removal of which, a very large proportion of all cases may be brought to recovery, even without the application of any remedial measures whatever.

PROGNOSIS.

Prognosis is an expression of the probable way in which the disease will terminate in any given case. Of course, the wisest and most experienced physicians can do nothing more than express an opinion respecting the result of the disease, since no one can foresee what accidents or unfortuitous circumstances may appear to prevent the result which might otherwise have been favorable. It is also impossible to tell in any given case how long the vital forces of the patient will hold out, or whether the patient has sufficient vital power to bring him to a successful issue. It is evident, then, that any expression respecting the termination of the case should be made with the greatest caution. It is frequently possible to guess with great accuracy, and a person of experience may be able to form from the various symptoms present and a consideration of the temperament, age, sex, constitution, and the hereditary tendencies of the patient, and also from his present condition and his condition at the beginning of the disease, a very correct estimate of the probabilities in the case. A knowledge of certain symptoms, which observation has shown to be, very frequently, if not always, characteristic of cases which will terminate fatally, is of great service as an aid to a correct prognosis. The following may be mentioned as among the most unfavorable symptoms: Dropsy occurring in connection with some organic disease, as of the kidneys or heart; great emaciation coming on gradually, and steadily progressing in the latter stages of chronic disease; patches occurring on the mouth or in the fauces during the advanced stages of chronic disease; disposition to slide down in bed; delirium in which. al-

though at home, the patient expresses himself as desirous to go home; persistent drawing of the arm toward the body when an attempt is made to feel the pulse; difficulty in protruding the tongue, or loss of power to do so, together with great trembling when it is protruded; very great difficulty in breathing; obstinate hiccough; what is known as the "Hippocratic countenance," by which is meant the peculiar appearance of the face observed in the last agonies of death,—pinched nostrils, sunken eyes, hollow cheeks, and general aspect of suffering.

GENERAL PRINCIPLES OF TREATMENT.

A few remarks on the general principles of treatment which should govern all who have any responsibility to bear in the treatment of the sick will be in place at this point. It is necessary at the outset to study the case with care, inquiring respecting the history of the disease as well as the previous history of the patient. Examine carefully into his present condition, interrogating every part of the organism so as to be sure of ascertaining all of the morbid conditions present as far as possible. Be careful to ascertain the cause of the sickness if it is possible to do so. When this is done, then institute measures for the relief of the patient. The following suggestions may be of service:—

1. The first thing to be accomplished is the removal of the cause of the sickness when it has been ascertained, if it is of such a nature that its removal is possible. Sometimes this is not the case, but often it is. For instance, if a person has become sick from breathing an atmosphere filled with poisonous gases, or vapors from arsenical wall-papers, common sense would dictate that he should be removed from the poisonous atmosphere into one which is perfectly wholesome. If the illness is the result of eating unwholesome food or drinking water contaminated with germs, these causes should be removed at once. Even if the difficulty exists in the patient's mind, as is not infrequently the case, especially in nervous diseases, something may be done to secure its removal by exerting upon the patient a proper mental influence. The importance of attention to the cause of the disease and its removal is generally very much neglected, though it is evidently a matter of primary importance.

2. Never apply or administer any remedy without a clear idea of how the patient will derive advantage from it, and without its being clearly required. Hap-hazard treatment always does more harm than

good. The application of a remedy when there are no distinct indications for its use is likely to result in evil rather than good. When it is impossible to ascertain at once the real pathological condition, so that a systematic plan of treatment cannot be entered upon, do not adopt any plan of treatment, but study the case carefully, in the meantime administering only such remedies as are indicated for the immediate relief of the patient or the palliation of his symptoms.

3. A cardinal principle that should govern every physician or other person who engages in the treatment of the sick should be to act in harmony with nature; that is, to endeavor to facilitate the remedial processes which nature institutes and in many cases carries forward to a successful result. Be very careful never to hinder the efforts of nature by officious interference. It is a much safer error in the treatment of the sick to do too little than to do too much. While administering treatment of any sort, the immediate effect as well as the remote influence of the remedies employed should be very carefully watched and studied, not only for the purpose of securing good results with the case in hand, but in order to make the experience valuable with reference to the treatment of similar cases. In many cases, perhaps the majority, the thing to be accomplished by treatment is not to stop the morbid action which is in progress, but to modify or control it. In a great majority of cases, especially in acute diseases, the object of the morbid action is remedial. Nature is at work, endeavoring to free herself from obstruction, to remove obnoxious elements from the system, or in some way to remove existing causes of derangement and to restore harmony to the vital processes; but nature works blindly, she is not intelligent, and often destroys herself in the effort of self-preservation, by too great intensity of action. Hence, when the morbid action is becoming too intense, it should be checked by the employment of well-known means for lessening vital action, which have already been described and of which cold is the most useful and an almost indispensable agent in the treatment of nearly all acute diseases. When the vital action is sluggish or is of too little intensity for the accomplishment of the object desired, at least within a reasonable length of time, such remedies should be applied as will increase or stimulate vital activity, for which purpose heat, electricity, and water properly employed, are among the very best of agents. On this account, the three agents mentioned are among the most indispensable remedies in the treatment of all chronic diseases, which are chiefly char-

acterized by insufficiency of vital effort. The effort should always be made to restore as far as possible the balance of vital activity in the different parts of the system, which balance is always destroyed whenever a part or the whole of the system is in a state of disease.

4. Since nearly all cases of disease, especially of acute disease, will recover if left to themselves, provided the vitality of the patient holds out until the remedial process is accomplished, it is in many cases of the very greatest importance that proper attention should be given to economizing and preserving the vital forces of the patient. Hence it is evident that depressing agents should never be employed when they are not distinctly and positively indicated. It is indeed fortunate for the present generation that the old-fashioned methods of treatment, the essentials of which were blood-letting and violent purgation together with mercurial salivation and other harsh measures of treatment, have gone out of fashion. It has been offered as an apology for the decline of the popularity of the remedies mentioned, among intelligent practitioners, that the nature of disease has changed, or the constitution of the people has changed. It seems to us that the latter suggestion is the true one, and in our opinion it is no wonder that the constitution of the present generation is decidedly different from that of the preceding, and that, as we have often heard said, "bleeding and purging are not well borne by people nowadays." The only wonder to us is that the people of the present generation have any constitution at all, with the exception of an individual now and then who is so happy as to be the descendant of some person who fortunately escaped the old-fashioned "mercurial course" of the last generation. The old idea that disease is a condition of excessive vitality was exploded long ago, and we are now waiting for the explosion of the modern fallacy, that all diseases, or a great share of them, are conditions of deficient vitality requiring stimulation carried to as great an extreme as was depletion in the old plan of treatment. The folly of the excessive-stimulant plan is still more clearly seen when it appears, as it does whenever careful and candid investigation is made, that the remedies employed as stimulants invariably operate in a manner directly opposite to the way in which they are intended to act. It has been most thoroughly demonstrated that alcohol, the most largely employed of the so-called stimulants, is a powerful depressant instead of a stimulant, that it destroys instead of creating force, and that it obstructs rather than re-inforces vitality. The

proper plan to pursue in choosing remedies is to select those which will accomplish the desired result with the least expense of vitality to the patient, as by this means he will be given the best possible chance for recovery; and in case there is any doubt whether the application of a certain remedy will do more harm than good, that is, whether it will hinder more than it will help the remedial process, or weaken the patient by lessening his vitality more than it will aid him by checking the morbid process,—we say, whenever there is any doubt as to which of these two ways will be that in which a remedy will operate, the remedy should by all means be omitted, as it will be far safer to trust the patient in the hands of nature than to incur the risk of employing a doubtful remedy.

5. In the treatment of disease, four classes of cases, considered with reference to the results of treatment, come under consideration: (1) Those in which by proper treatment a complete and perfect cure can be effected; (2) Those in which the disease process can be checked, the patient made very comfortable, and his life thus greatly prolonged; (3) Those in which nothing can be done except to delay the progress of the disease and lessen the patient's suffering; (4) Those which are not only absolutely incurable, but the progress of which can in no way be affected by treatment and all that can be done is simply to palliate the patient's sufferings and smooth his pathway to the grave. Whenever a case is taken in hand for treatment it should be carefully considered with reference to which of the results described may be expected; and although the case may be evidently hopeless it should not be abandoned, but all should be done which can be done to meet the indications in the case, if not for cure, for the palliation of the disease. This plan has the advantage also that in not a few instances in which it has been pursued the unfavorable opinion which has been entertained has by the result been shown to be erroneous, since the patient has, in spite of all discouraging predictions, ultimately recovered. We have in practice met several cases of this sort, and have in consequence made it a rule of practice never to abandon a case so long as there is the faintest ray of hope of effecting a cure, and even when the last hope seems to be destroyed still to continue our efforts for the relief of the patient even though nothing more than mere palliation may be expected; and even in cases of this sort we have in some instances been most happily disappointed in seeing patients recover, notwithstanding the apparently hopeless character of their disease.

GENERAL DISEASES.

Under this head we shall include chiefly those diseases which affect the whole system and which require in consequence general or systemic treatment. For convenience, and as we shall find no better opportunity for so doing, we will first give the proper methods of treatment of what have been already described as primary forms of disease.

IRRITATION.

This condition has already been described as being one in which there is an excitement or increased intensity of vital action.

Causes.—The causes of irritation, in the sense in which we are here considering it, are chiefly an increased intensity of the so-called vital stimuli, or those agents upon which the maintenance of life and health depends, as an excess of food, light, electricity, or mental influence. By any of these agents the vital action of the whole or a part of the organism may be increased to an abnormal extent. Where the excitement is not sufficiently intense to occasion disturbances of other parts of the organism it is called irritation.

Treatment.—The proper treatment of this condition involves chiefly the removal of the exciting cause. The departure from a normal condition is so slight that where the cause is removed, the vital forces quickly acquire equilibrium, and harmony is readily established. If the irritation arises from an excess of food, it is best not only to refrain from taking food in excessive quantities but to practice abstinence, or to take food in less than the quantity required in health for a short time. The same principle applies with reference to other causes of irritation and abnormal excitement. If the patient has been subject to excessive heat, make cooling applications. If irritation of the eyes has been produced by exposure to intense light, remove the light altogether or to a great extent for a short time. So, also, if the cause is too great mental activity from exciting influences, the latter should not only be removed but the patient should be given as nearly as possible absolute mental rest till an equilibrium has been established. In all forms of irritation sleep is a sovereign remedy, as the vital action is always lower

during this condition. Soothing applications, such as a tepid bath, a vapor bath of moderate temperature, gentle rubbing or massage, and in many cases the application of a mild current of electricity, are of the greatest service in the removal of irritation, whether general or local. Avoid cold applications in simple irritation without congestion.

CONGESTION.

This condition has been described as one in which a part of the body contains too much blood. This morbid condition must evidently be of a local character, since the whole body could not be congested. Too much blood in one part necessarily implies too little in another part, unless, indeed, the patient be suffering from the condition known as plethora, in which the whole quantity of blood is abnormally increased, and the usual symptoms of local congestion are extended to the whole system. The results of congestion and its accompanying symptoms vary greatly, according as it is active or passive in character.

Symptoms of Congestion.—Active congestion is characterized by an increased amount of arterial blood in an organ, the result of which may be temporary swelling or enlargement and pain, together with an increase of temperature and even redness in color. These symptoms are also all present in inflammation. That condition, as we shall show presently, is accompanied with other characteristic symptoms not found in simple congestion.

In passive congestion there may be swelling of the part, from the turgescence of blood or from the effusion of serum into the tissues, as in dropsy. If there is a change in color, the part will be dark and purplish, instead of bright red as in active congestion and inflammation; there may also be pain in passive congestion. If pain is present, it will be of a dull, heavy, continuous character, instead of acute, sharp, and lancinating, as is usually the case in active congestion. The causes of both active and passive congestion having already been given elsewhere, we do not need to delay on the subject here.

Treatment.—In the treatment of congestion it is of primary importance that its character should be recognized, as the modes of treatment to be employed in the two forms of congestion are essentially different. In active congestion there is excessive activity of the circulation, and consequently, in many cases, of all the tissues of the organ or part affected. A most important indication of treatment,

then, is to lessen the activity of the blood-vessels, as well as of the other tissues in the congested part. There is no better agent for accomplishing this than cold properly applied. The degree of the intensity of the application will depend upon the violence of the action and the location of the disease. Cold applications may consist of simply tepid bathing or sponging, or the application of cool compresses, the cold pack, cold foot-bath, cold spray or douche, or the application of ice, according to the part affected or the effect desired. Special modes of application in the conditions of different cases will be pointed out in connection with the description of local diseases. Another excellent means of counteracting the effects of active congestion is derivative treatment; that is, artificially producing temporary congestion in other parts of the body, thus drawing the blood away from the affected part. This may be most easily done by means of hot applications in the form of fomentations or local hot baths. Dry heat may also be employed. In some cases, great benefit may also be obtained from the temporary ligation of certain parts, as of the limbs, by which a large amount of blood may be temporarily removed from the circulation. When possible also, the congested part should be placed in such a position that gravitation will aid in relieving it of its surplus blood, as, for example, in congestion of the brain the head should be raised above the level of the other portions of the body. The same may be said of local congestions elsewhere. This remark applies to both active and passive congestion.

In the treatment of passive congestion, the application of cold is less frequently indicated than in active congestion. In these cases, hot applications are generally much more successful, although we have usually obtained the best results in the use of alternate hot and cold applications. Cold applications produce at first a strong contraction of the blood-vessels and thus an increased activity; but if long continued, the vitality of the part is lowered, and hence the original difficulty will be increased. So also in the use of hot applications; the effect at first is astringent in character, like that of cold. It should be remarked, however, that applications for this purpose must be hot; that is, of a temperature above that of the body. Applications of a temperature from 106° to 110° F. are best. In extreme cases, a still higher temperature should be used. If too long continued, hot applications result in rather increasing than relieving the local difficulty. By alternating the two, however, it is possible to continue and intensify the good effects of

each remedy for some time. As a general rule in the treatment of congestion, hot and cold applications should be made at intervals of from two to six hours, and between the applications the part should be covered with a tepid compress, changed sufficiently often to prevent its becoming warm. Chronic and passive congestion of internal organs, when accessible, as in chronic congestion of the mucous membrane of the pharynx, may be benefited by the use of astringents; but by far the most potent remedy is the application of hot water or steam, as hot as can be borne without pain,—a temperature of 103° to 125°. When the congested parts are not accessible, as in the case of the liver, spleen, and kidneys, the hot and cold douche applied over the affected part supplies the best known means of relieving the difficulty. Another point of great importance in the treatment of passive congestion, which indeed should be attended to at the outset of treatment, is ascertaining the cause of the disease. If, as is often the case, the congestion is produced by mechanical obstruction of any sort, as by restriction of the clothing, by pressure, or by any other means of a like character, it should be promptly removed. Passive congestion may often be greatly relieved by rubbing. Care should be taken to rub the parts in such a direction as to press the blood forward in the veins, thus aiding the venous circulation, which is chiefly at fault in passive congestion. In cases in which the difficulty is continued until transfusion of the serum into the tissues has occurred, causing puffiness or swelling of the parts, great advantage may often be derived from the use of properly adjusted bandages. The bandage should be applied smoothly and with even pressure over all parts of the organ, in such a manner as not to interrupt the circulation. The rubber bandage is preferable to all others for this purpose.

DEPRESSION.

As elsewhere stated, depression is a condition in which there is a deficiency of vital action. It may be either general or local in character. Its symptoms may be either an increase or decrease of irritability. Increase of irritability in consequence of depression, although a seeming anomaly, is a well-established fact, having been determined by numerous observations, not only upon men but also upon animals, in which it is frequently found that just before dissolution, when the depression has reached the highest degree compatible with life, irritability is sometimes enormously increased. The irritability of depression is,

however, peculiar, being in a marked degree deficient in strength and vigor, usually lasting but for a very brief period, and being followed by a great increase in depression. Depression is one of the most prominent symptoms in all diseases of debility, in cases of convalescence from acute diseases or serious surgical injuries, and a great variety of local and general conditions.

The causes of depression, as elsewhere shown, are anything whatever which exhausts the vital forces faster than they are replenished by nutrition. The treatment of depression is exactly what would be indicated by the common sense of the most inexperienced person; that is, simply to economize the vital forces by lessening the expenditure of force so far as possible and increasing the supply through improved and augmented nutrition. The treatment of depression implies the application of all hygienic means, obedience to all hygienic rules, and placing the system so far as possible in harmony with all the laws of nature. When this is done, unless the cause is one which cannot be removed, the patient will shortly recover. The length of time required will, of course, depend upon the natural activity of his system, upon the degree of reserve force which he possesses, and upon the thoroughness with which he complies with the conditions necessary for recovery.

The popular treatment for depression is the use of tonics and stimulants. The theory of the application is that they impart strength to the enervated system. That this is not the case, however, is well known to every scientific physician. Indeed, not a few of the most eminent physicians declare with emphasis that stimulants are not strengthening, that stimulation means simply excitement, which, as we have already seen, in depression is always followed by an increase of depression, and that stimulants decrease rather than augment vital force. We also have good authority for the statement that tonics and stimulants are precisely alike in their action, differing only in degree. On account of their mildly stimulating effects, the depression following the use of tonics is not so noticeable as in the employment of stimulants proper. We cannot but regard the use of tonics and stimulants in chronic debility of any sort as erroneous in principle and deceptive in practice. They produce a feeling of strength which is not accompanied with an actual increase in vigor.

This is well shown in the experiments of Dr. Smith upon tea and coffee, two of the mildest of all agents of this class. He found that after taking a cup of strong tea, although previously depressed from prolonged

exercise, he felt an increased disposition to active exercise, and found himself able to take muscular exercise with much greater ease than under ordinary circumstances. Thus far the effects of the stimulant and tonic seemed to be satisfactory, but unfortunately for the theory which maintains the utility of these agents he found upon awakening the next morning after the experiment, even though he had been recuperated by the influence of sleep, that he felt very much more fatigued and exhausted than after exercise without the use of tonics or stimulants. This experiment conclusively shows that the supposed strength imparted by tonic or stimulant is not real force or vigor, but simply apparent. By the use of tonics and stimulants the system is goaded into an expenditure of the force and vigor which it already possesses, but no additional strength is imparted.

This view of the action of tonics and stimulants is based upon scientific evidence so conclusive that there can be no doubt of its correctness. We do not say, however, as the reader has doubtless observed, that tonics and stimulants should never be employed in conditions of depression. What we insist upon is that they should never be employed with the idea that they impart strength, since this is a thoroughly exposed fallacy. They should be employed only when it is desired to accomplish what they are only capable of accomplishing; namely, to bring into action or develop forces which the system already possesses in a latent form. There are, no doubt, many cases in which this is in the highest degree desirable.

These cases are those in which there has been a sudden depression of vital action from any cause whatever. In these cases the sudden lowering of vital activity may be so great as to occasion death by the cessation of some of the important functions of the body before the system has had time to recover itself, although there may be sufficient vital force to bring about recovery if it were only developed at the right moment.

In cases of this sort the most powerful stimulants and tonics may be employed, as in the depression attendant upon asphyxia from any cause, syncope, or fainting, from loss of blood, great prostration as the result of poisoning, sudden collapse occurring in the course of some intensely acute disease, etc. In these cases life may be saved by the judicious employment of stimulants; yet even in such cases great care should be used that the stimulant is not employed so freely nor for so great length of time as to exhaust the vital forces beyond the extent to which they are recuperated, as when this is done much more harm

than good results from their use. Hence, the utility of stimulants is of a very limited character, and they should be employed only when good can be accomplished by their transient effects. Ordinarily, stimulants and tonics should be most sedulously avoided in the continuous treatment of depression. They are only for cases of emergency, and should never be employed week after week, or continued for months, as is often the case. Alcohol is not a stimulant, but a depressant.

We firmly believe with many noted physicians that notwithstanding the good results which may be obtained by the use of drug stimulants, they may be dispensed with altogether, if proper substitutes are employed, without any detriment to the patient's chances for recovery. Electricity as a stimulant is vastly superior to alcohol or any other stimulant or tonic furnished by the materia medica. This potent agent so closely resembles the nerve force itself that it seems to be almost equivalent to a substitute in cases of extreme depression. As an excitant of vital action it is vastly superior to alcohol, and when properly used no unpleasant effects whatever follow its employment. It is indicated in all cases of debility or depression in which its use is not interdicted by some personal idiosyncrasy antagonistic to its influence. Sunlight employed in the form of the sun-bath is another natural tonic, the application of which may be indefinitely repeated without fear of causing subsequent increase of the diseased condition for which it is employed.

In all cases characterized by debility, avoid the use of any depressing agent. The patient should be relieved of care, and should be surrounded with cheerful conditions. The food should be abundant and wholesome, but simple in character and easy of digestion. As a general rule in chronic depression, the severe practices of the old-fashioned water-cure treatment should be most carefully avoided. Water may be employed judiciously with great advantage as a means of increasing nutrition. Massage may be carefully employed for the same purpose to very great advantage. More specific directions for treatment will be given in the consideration of various diseases characterized by depression and debility.

INFLAMMATION.

Inflammation, like congestion, is characterized by the four special symptoms, heat, pain, redness, and swelling. In inflammation, however, these symptoms are all much more intense than in conges-

tion. In this respect, inflammation may be considered as an advanced stage of irritation. It includes in its different stages all the primary morbid actions previously mentioned; namely, irritation, both active and passive congestion, and depression. On account of its resemblance to congestion it is sometimes not easy to distinguish between the two diseases, especially at the beginning of the morbid condition or process. Indeed, at the beginning there is no distinction, for the inflammatory process is induced by irritation and congestion. The real distinction between inflammation and congestion is not easily perceptible in the early stages, at least before any special results have been produced. Microscopical researches have shown, however, that there is a difference even at this early period, which consists in the great increase of white blood corpuscles. This may be very easily observed in the delicate web of a frog's foot placed beneath the microscope. Upon placing the point of a needle or other mechanical or chemical irritant upon the membrane, all of the phenomena of irritation, congestion, and inflammation may be observed occurring in their proper order, the beginning of inflammation proper being indicated by the accumulation of white blood corpuscles in and about the gradually dilated blood-vessels of the affected part. There is every reason for believing that this is exactly what occurs in larger animals and human beings. If inflammation is arrested in its first stages, the effects are only those described. If continuous, however, the morbid action may give rise to the exudation of matters which afterward harden and cause induration of the parts, or the intensely local action may become so great as to occasion death of some of the tissues, involving coagulation of the blood and obstruction of the circulation.

This is what occurs in a boil. When death of the tissues has taken place, the dead parts are treated like foreign substances in order to prevent contamination of the system by absorption of the dead and disorganizing matter. The dead part is separated from the living by a wall of defense which is thrown up about it, and by a layer of corpuscles exactly resembling white corpuscles of the blood, but in this case termed pus corpuscles. It is these corpuscles which form the greater part of the whitish or yellowish discharge from abscesses or suppurating wounds. As thus seen, it is wholly devoid of offensive odor, and is termed healthy pus; but when by the breaking down of dead tissues the pus becomes filled with products of decay, and is watery in character, it is termed unhealthy, or ichorous pus, and often has a very

offensive odor. Pus is formed partly from the blood, by the removal of its white corpuscles, and partly from the tissues themselves, which undergo destruction about the dead part for the purpose of loosening it and thus removing it from the body. If a part which has thus died has been loosened and removed, an examination of the surface beneath will show that underneath the purulent matter is a layer of small red prominences termed granulations, which indicate that new tissue is forming. By degrees the cavity left, if not too large, will be filled up with newly made tissue, which is, however, of a somewhat different character from that which was removed. It sometimes happens that in consequence of a still greater intensity of inflammatory action the tissue of the diseased part dies very suddenly, from the stagnation and coagulation of the blood in its blood-vessels. This is termed gangrene, the consideration of which must be left for the section devoted to surgery, to which province it particularly belongs.

Inflammation is generally described as being acute, sub-acute, or chronic, the distinctions between which are the same as those which govern the classification of other diseases. The symptoms above described are those of acute inflammation. In sub-acute inflammation the same symptoms will be noted, though their intensity will be less, and they succeed each other at longer intervals. In both acute and sub-acute inflammation the whole system participates in the disturbance. The greater the extent and the higher the degree of the intensity of the inflammatory process, the greater will be the general disturbance. The temperature of the body as well as that of the diseased part will be found almost invariably to be above normal. When a large and important organ, as a lung, the liver, or the stomach, is affected, the temperature of the whole body may rise to a very high point, while a very slight inflammation accompanying the efforts of the system to expel a sliver from the skin may not at all affect the general temperature. It is the great elevation of temperature which in the majority of inflammations is the thing to be most dreaded and which is the chief cause of a fatal result in a large share of the cases in which death occurs from inflammatory affections.

In what is termed chronic inflammation, the intensity of the vital action is much less than in acute inflammatory affections. Indeed, although the results of so-called chronic inflammation are in some respects similar to those of acute inflammatory action, it appears to us that there are good reasons for believing that there is really no such

thing as chronic inflammation, but that the condition generally denoted by this term is really only chronic congestion, either active or passive. We are sure that this is true of a large share of the cases usually included under the head of chronic inflammation, whether it be applicable to all or not, and we have never yet found difficulty in explaining the phenomena of what is generally termed chronic inflammation in accordance with the views expressed. When a part is affected by acute inflammation, if recovery does not take place it finally continues in a state of active or passive congestion, most frequently the latter, which is the condition generally known as sub-acute or chronic inflammation. Inflammations have been classified according to the variety of tissue affected by them, but as this classification is of no practical importance, we need not present it here. The especial characteristics of local inflammations will be given in connection with their description elsewhere.

Causes.—Inflammation may be induced by mechanical or chemical irritants, by poisons generated in the system or received into it from without, through morbid nervous influences, and perhaps by other means. Its general character is the same, however, whatever may be its cause.

Treatment.—The treatment of inflammation is essentially the same as that for active congestion, which has already been quite fully described. In inflammation, however, as the intensity of the morbid action is much greater than in simple congestion, the activity of the remedies employed should be proportionally increased. In the first stages of inflammation, cold and other agents for reducing heat and vital action should be energetically employed. The morbid tendency may be combated not only by the local application of cold, but by derivative treatment as directed in congestion, and also, from reflex influence, by applications to remote parts; as, for example, inflammation of the brain may be treated by the application of cold, even ice, to the head, and of heat to an appropriate extent. By these means the head will be cooled by the direct abstraction of heat, and also through the contraction of its blood-vessels, in consequence of the stimulation of the nerve centers which control the circulation of the brain. The same means may be employed in the treatment of inflammation of the lungs, liver, kidneys, spleen, and other internal organs. When inflammation has continued until it becomes evident that suppuration must take place, it is often necessary to moderate the cold

applications, and in many instances it is best to employ hot applications, and thus facilitate the suppurative process so as to hasten the termination of the disease. Care should be taken in the treatment of the inflamed parts to avoid using cold in such a manner as to produce gangrene. The color of the affected part should be frequently observed. So long as it remains of a dull red color and is hot to the touch, cold may be safely employed. Bright scarlet redness without great heat should, however, be regarded as a contra-indication for the employment of cold, as it is a primary symptom of the death of the tissue, or gangrene, and when present, hot applications should be promptly made. Blueness of an inflamed part is also an indication for the application of heat.

In severe inflammatory attacks it should be recollected that the whole system requires attention as well as the local seat of the disease. The temperature of the patient should be kept as nearly as possible at the normal standard by means of sponge baths, packs, compresses about the trunk, ice to the spine, cold baths, and the other remedies elsewhere described as useful for this purpose. The diet of the patient should be unstimulating, and at the outset of the disease restricted in amount. In the beginning of an inflammatory affection the person may, without detriment, fast for twenty-four hours, and should for a day or two take only a very little and very light food. The importance of this observation is well shown by the fact that Nature usually indicates her inability to dispose of food under these circumstances by taking away the appetite. More specific directions for the treatment of inflammatory affections of special organs are given in connection with the treatment of local diseases.

GENERAL DISEASES OF NUTRITION.

Under the head of general diseases proper, we will first call attention to those which are dependent upon general disturbances of nutrition, and which, although in some instances involving numerous local derangements, are not known to be dependent upon any specific local disease or morbid condition. First among diseases of this class, as the most frequent of all, we will call attention to—

ANEMIA.

This is a disease which is characterized by deficiency in the red blood corpuscles and in the nutritive elements of the blood. There are two varieties, acute and chronic.

ACUTE ANEMIA.

SYMPTOMS.—Great pallor; hollow cheeks; sunken eyes; pinched nose; coldness; dry or clammy skin; frequently a weak pulse, which is easily excited by slight exercise; fainting, or tendency to faint on slight exertion; great weakness; swelling of the feet.

Cause.—The most frequent and almost the only cause of acute anemia is excessive hemorrhage. The occasion may be a wound of any sort, surgical operations, blood-letting, bursting of a blood-vessel, nose-bleed, hemorrhage from the lungs or from an ulcer in the stomach, as in bloody vomiting. Perhaps the most common cause of acute anemia is hemorrhage from the womb in connection with profuse menstruation, a fibroid growth, or some other diseased condition of the womb. Acute anemia is distinguished from the chronic form by its sudden appearance. It may be produced in an hour by sudden hemorrhage or may be several days in coming on in consequence of repeated small hemorrhages.

Treatment. — The first essential in the treatment of acute anemia from hemorrhage is rest. The patient should be placed at once in a horizontal position and kept so for some time, if there is the least tendency to syncope, or fainting, whenever he attempts to sit up or walk. After a large hemorrhage, absolute rest should be required of the patient, even if he does not experience premonitory symptoms of fainting when in an erect position. It is very important that this

point should be recollected, as in many cases patients have died from sudden paralysis of the heart in consequence of standing upon their feet or walking after a severe hemorrhage. Sometimes the patient must be confined in bed, not only for a few days but for several weeks. On account of there having been so great loss of blood, every means should of course be taken to increase the patient's nutrition. He should be given an abundance of wholesome food prepared in a manner easy of assimilation. Such simple and easily digested foods as eggs, poached or boiled, boiled milk, kumyzoon, good buttermilk, purée of peas, beans, or lentils, boiled rice, well-cooked gruels and other preparations of grains, zwieback, granola, granose, lac vegetal, malted gluten, and nut meal are suitable. If food cannot be taken except in small quantity, the patient should be fed four times a day, with an interval of about four hours between meals. When four meals are taken, the alternate meals should consist only of preparations of milk or eggs. Beef tea and extracts are worthless. Meats of all sorts are more difficult of digestion than milk and eggs.

The application of a hot water bag over the stomach after each meal is an excellent means of aiding digestion. The general nutritive processes may be stimulated by fomentation of the spine followed by a cool sponge bath and vigorous rubbing administered every morning. The application of olive or almond oil in connection with the rubbing is a measure of value. When possible, the patient should be placed on a cot in the open air daily, and for as many hours as possible. When the weather will not permit of out-of-door exposure, the patient should be well covered in bed and the windows and doors opened so as to allow a free circulation of cool air. This should be repeated at least twice daily, from five minutes to an hour each time, increasing the time as the patient becomes accustomed to the contact with cold air. The tonic effects of pure cold air are very remarkable.

Electricity applied in the form of general faradization, and also galvanization of the spine and of the great sympathetic centers, are measures of value.

It is, of course, important to employ such means as may be indicated for preventing a recurrence of hemorrhage.

The tendency to collapse which follows severe hemorrhage should be counteracted by heat applied to the spine and over the region of the heart, also about the head.

CHRONIC ANEMIA.

***SYMPTOMS.**— Dry, thin, wrinkled, pale or tawny skin; emaciation; shortness of breath; nervousness; baldness; dropsy; fatty degeneration of the heart, liver, kidneys, and other parts; in women, amenorrhea and leucorrhea, in many cases.*

The symptoms of chronic anemia are, with slight exceptions, included in those of acute anemia, the chief difference being that instead of being produced so suddenly as in the acute form they occupy a long time in appearing.

Causes.— Under the leading causes should be noticed first, predisposition. Some persons inherit a tendency to hemorrhage, having what is termed hemorrhagic diathesis. Such persons are commonly known as "bleeders." Women are much more liable to chronic anemia than men, principally owing to the fact that they have about one-tenth less blood in proportion to the weight of the body, and partly because they are more exposed to the causes which occasion the disease in the chronic form. Another cause of anemia is deficient nutrition, or the use of too small a quantity of food. As the blood is made of what we eat, it is evident that if too small a quantity of nutritive material is introduced into the blood, its elements will be deficient. Deficiency of light and of pure air may also be justly mentioned as common causes of anemia. This is very clearly shown by the great frequency of the disease among milliners, factory operatives, and others who are much excluded from the sunshine, and obliged to breathe impure air. Excessive or deficient physical exercise is another frequent cause of anemia. A person who takes too much exercise may use up the elements of the blood more rapidly than they can be produced from the food which he is able to digest. On the other hand, deficient exercise occasions deficient nutrition by causing loss of appetite, impaired digestion, etc. Exposure to excessive heat or to a low temperature are both causes of anemia. Prolonged nursing in women, sexual excesses in either sex, serious hemorrhage, external or internal, and numerous forms of disease, particularly spermatorrhea, leucorrhea, animal parasites, dyspepsia, and fever, are frequent causes of anemia. Parasites are a common cause of the disease in this country, and very frequently in Egypt, where a peculiar animal parasite infests the small intestines of individuals, and thrives by sucking the blood of the patient. Chronic dyspepsia is one of the most frequent of all causes of anemia. A person cannot be a dyspeptic for any length of time without becoming to

a greater or less degree anemic. A severe fever will produce anemia almost as rapidly as a hemorrhage, by interfering with the nutritive processes as well as by destruction of the nutritive elements of the body through rise of temperature. Chronic anemia is a very common affection, especially among women and children. It should not be looked upon as a diseased condition which is attended by no danger, as it is a powerful predisposing cause of other and more fatal diseases, besides being itself capable of producing death if sufficiently long continued.

Treatment.—It is evident that the first step in the treatment of this disease should be to remove the cause. If the cause is dyspepsia, this must receive attention; if intestinal parasites, they must be dislodged; if prolonged nursing, nursing must be interdicted; if too little food, a larger quantity of nourishing, wholesome food must be employed. The mistake must not be made, however, that by good food is meant what is usually termed rich food or a stimulating diet. Neither should a large quantity of animal food be taken, especially when the digestive organs are impaired, a fact which is seldom observed. The suggestions made respecting diet for acute anemia apply equally to this form of the disease, as do also the other measures of treatment suggested. Rest in bed for one to four weeks is usually an excellent measure at the beginning of the course of treatment. Special attention must, of course, be given to the conditions which have given rise to the anemia. If indigestion is the principal cause, the particular form of the digestive disturbance must be ascertained by careful investigation of the patient's condition, which should include, if possible, an examination of the stomach fluid by the method elsewhere explained. (See page 1619.)

Great care must be taken in beginning a course of exercise for patients who have been confined to the bed. At first the exercise should be simply passive, in the form of massage. Manual Swedish movements may be added, then bed exercises, and a few days later the patient may be gotten upon his feet, and the amount of daily exercise may be gradually increased until carriage riding, horseback riding, walking, or bicycle riding may be frequently indulged in. A careful course of physical training is essential as a means of securing perfect recovery in cases of chronic anemia due to indigestion, or any other serious disturbance of the nutritive processes.

The popular remedy for anemia in all its forms is iron, which is administered in a great variety of forms. The theory upon which this

practice is based is that the blood corpuscles are deficient on account of the deficient supply of iron, or at any rate that their increase may be augmented by a supply of iron to the system. That this is an error, however, will be readily seen when attention is given to the fact that the food contains a much larger amount of iron than is really needed by the system, as also by the fact to which we have called attention in considering the use of iron in medicine, that it is exceedingly doubtful whether the system can assimilate iron or any other mineral in an inorganic state. It is certain that the partially organized form in which inorganic substances are received as food is much more favorable to their absorption and assimilation than the inorganic state in which they are employed in medicine.

In cases of hypopepsia, iron is doubtless sometimes useful as an aid to digestion through stimulation of the glands which form the gastric juice. It thus becomes a means of replenishing the blood indirectly, although incapable of entering directly into the formation of the red corpuscles, as has been erroneously supposed.

An exceedingly fatal, but fortunately rare, form of this disease, known as *pernicious anemia*, has been observed during the last few years. It is particularly apt to occur during pregnancy, and especially in women who have borne several children in rapid succession. In genuine cases of this disease it is stated by the few physicians who have observed them that no remedies thus far employed have been of any value. The patients steadily decline from the first in spite of all that can be done for their relief, the fatal termination being reached in from six or eight weeks to some months.

Recent discoveries in relation to the blood have thrown much light upon the nature of anemia, and render it important that a careful microscopical examination of the blood should be made in every case of pronounced anemia, for the purpose of determining its character, and as an aid to the determination not only of the proper methods of treatment to be employed, but of the probabilities of recovery.

CHLOROSIS.

***SYMPTOMS.**—Pale or yellowish countenance; dark circles about the eyes; palpitation of the heart; lassitude; variable and perverted appetite; depression of the mind; usually suppressed or scanty menstruation.*

Chlorosis is a disease closely allied to anemia. It in fact presents

many of the symptoms of the latter disease, though there are several points of difference, one of the most marked of which is that there is little or no emaciation in chlorosis and may often be an increase of flesh, while in anæmia the opposite is almost invariably the case. Chlorosis generally occurs in young girls just entering womanhood, though it may occur in women at any period of life, and there have been a few instances of its occurrence in men. It usually occurs just after the beginning of menstruation. One of the first symptoms noticed is lassitude on slight exercise. Increasing loss of color is next observed, the cheeks becoming blanched, and, in brunettes and persons with dark complexions, acquiring a yellowish tinge which has a greenish appearance in contrast with the dark rings that encircle the eyes. In addition to the symptoms enumerated above, the patient suffers with anæmia, or the symptoms of anæmia, such as great shortness of breath upon taking even slight exercise. In many cases, hacking cough, nervous disorders, derangement of the digestion, obstinate constipation of the bowels. Sometimes slight dropsical appearance and swelling of the ankles occur, although this last symptom is not so serious as is generally supposed, the appearance of œdema being deceptive. One of the most unaccountable peculiarities of the disease is the great perversion of the appetite, the patient frequently eating slate and lead pencils, chalk, clay, even cotton, wool, and other indigéstible substances, when not observed. It is generally supposed that suppression of menstruation, or amenorrhœa, is a constant symptom in chlorosis. This is not the case, as many cases have been observed in which this function was performed as regularly and even more profusely than in health.

Causes.—Among the causes of chlorosis the first that should be mentioned are unhygienic habits of life, particularly sedentary habits, and the unwholesome mental condition produced by the reading of novels and other sentimental literature. The practice of secret vice very often entails upon its victims this serious disease. Many cases of chlorosis are due to the artificial modes of life imposed upon young girls by the habits of modern society. This accounts for the very great increase in the frequency of the disease which has been noticed within the last forty or fifty years. There can be no doubt that the neglect of physical culture among girls is a most potent cause of this malady. An unwholesome diet, particularly the use of pastry, highly seasoned food, condiments, fats, and sugar in the shape of preserves, candies, and sweetmeats, has much to do in producing this disease. Lastly may be mentioned a hered-

itary predisposition and congenital defects. An eminent German observer has shown that in many of the worst cases of this disease the large arteries of the body are smaller than normal, to which defect he thinks the disease is in many cases due. The popular supposition that it is caused by suppression of the menses is not supported by facts. In this, as in most other diseases in which the symptom referred to is observed, the suppression of the menstrual function is an effect of the disease rather than the opposite. It is necessary to keep this point in mind, as it has an important bearing on the treatment. Another popular theory respecting the origin of the disease is that it originates in the emotions. Dr. Meinert, of Dresden, has shown that dilatation of the stomach exists in nearly all cases of chlorosis. The symptoms are doubtless due to indigestion and disturbance of the sympathetic nervous system.

Treatment.—The first measures to be adopted are those which will secure, as far as possible, the removal of the causes of the affection. The diet should be properly regulated, the patient being required to take such food as will encourage elimination from the system of the products of excretion, which are diminished in this affection in a marked degree, the urine being pale and containing less than the usual portion of urea. Fruits, and such grains as oatmeal and whole-wheat meal, are among the most excellent articles of food for persons suffering with chlorosis. Sugar and fats should be avoided. Exercise should be taken in the open air, and the patient should be exposed to the sunshine as much as possible and surrounded with cheerful conditions.

The same general measures recommended for anemia should be employed in chlorosis. In addition, it is also well to employ measures to aid elimination, which is nearly always defective in these cases. A fomentation applied over the region of the liver at night, followed by the wet girdle to be worn through the night, is an excellent measure. The wet girdle should be removed in the morning, a fomentation should be applied to the spine, and a cool sponge bath administered. A dry flannel bandage should be worn about the abdomen during the day. A wet-sheet pack or hot-air bath should be administered once or twice a week. Exercise out-of-doors, increased in vigor with the improvement in the patient's strength, is a valuable measure. Horseback riding and bicycle riding are measures which cannot be too highly recommended. The sitz bath

two or three times a week, the salt glow once or twice weekly, and general applications of electricity, are also valuable measures.

Remembering the observations which have been made by Dr. Meinert, of Dresden, that in most cases of chlorosis, dilatation and prolapse of the stomach or colon, or both stomach and colon, almost invariably exist, it is evident that thoroughgoing measures should be taken for the relief of these conditions. Dilatation of the stomach requires a careful regulation of the diet, both with relation to the dilatation and to the particular form of disturbance of function which may exist in connection with it. The exact condition of the digestive function can be ascertained only by examination of the stomach fluid obtained after a test meal (see page 1623). In the majority of these cases which have come under the observation of the writer, hypopepsia has been found present. In some cases, however, hyperpepsia is present. In hypopepsia, highly nitrogenous foods, such as eggs, peas and beans in the form of purée, nut meal, and gluten preparations should constitute the principal part of the diet. In hyperpepsia, farinaceous preparations and fruits are preferable. In all cases, special attention should be given to very thorough mastication of the food, hence food should chiefly be taken dry. This is one of the most important means of aiding stomach digestion in cases of dilatation. Abdominal massage for restoring the stomach and bowels to position, Swedish movements, and, in cases requiring it, lavage and applications of electricity to strengthen the abdominal muscles, are other measures of importance. Special pains should be taken to secure regularity of the bowels, as chlorosis is in many cases due to the absorption of poisons from the alimentary canal.

PLETHORA.

SYMPTOMS.—Excessive redness of the face and lips; increased heat of the body; unnaturally strong and full pulse; unnatural mental and physical activity.

This condition is exactly the opposite of anemia. It is characterized by an excessive activity of the heart and an increased number of the blood corpuscles. The blood is also highly charged with the waste products or excrementitious elements of the body. Not the smallest of the dangers connected with plethora is cerebral apoplexy, a paralysis resulting from rupture of the blood-vessels in the brain.

Causes.—The causes of plethora are too much food, especially highly seasoned and stimulating articles; the excessive use of fats, sugar, and other clogging substances, and deficient exercise.

Treatment.—The treatment of plethora is, in most respects, as nearly as possible opposite to that recommended in anemia. The patient should be instructed to restrict his diet and to abstain wholly from the use of flesh, condiments, and all stimulating foods. Sugar and fats should be used sparingly. The diet should consist chiefly of fruits and grains, and food should be taken twice a day, never between meals. The patient should take a large amount of exercise daily, and be in the open air as much as possible. A course of energetic eliminative treatment is necessary to arouse to activity the sluggish organs, and by this means to purify the blood and thus improve it in both quality and quantity. There is no necessity for blood-letting, the practice so much in use for the relief of plethora a quarter of a century ago. At that time it was so commonly resorted to for this purpose that ordinary barbers practiced it, and many people considered it almost as essential to be bled as to be shaved or have their hair cut. All the benefits that could possibly be derived from bleeding may be obtained from the use of Turkish, Russian, vapor, and hot-air baths, and from the use of packs, rubbing wet-sheets, electro-thermal, and other forms of bath. Medical treatment is scarcely called for in the treatment of this affection, since recovery speedily takes place when the causes are removed.

A hot-air bath or wet-sheet pack for thirty minutes to one hour daily, followed by a cool shower bath or a cool sponge bath, is a simple measure of treatment suited to most cases. Exercise should be taken to the extent of vigorous perspiration and gentle fatigue every day, and gradually increased.

OBESITY, OR CORPULENCE.

***SYMPTOMS.**—Excessive fatness; excessive sebaceous and perspiratory secretion; shortness of breath, and often palpitation of the heart upon making slight exertion.*

The characteristics of this disease are so well known that it is unnecessary to go into an elaborate description of the condition of the system in corpulency. The disease may occur at any time of life, but is by far the most frequent in early infancy and after forty years of age. Women are more frequently affected than men, the disease usually making its appearance in them at, or near, the change of life.

Singular as it may appear, the condition previously described as plethora is by no means constant in obesity. In many cases the condition of the blood is that of anemia, there being a marked deficiency in the proportion of red blood corpuscles.

Causes. — There is an intimate relation between obesity and the three diseases, rheumatism, gout, and diabetes.

Excessive food and deficient exercise are unquestionably a most common cause of obesity. In a few cases, the disease may be chiefly dependent upon hereditary predisposition, but as a rule, excessive eating and sedentary habits in the individual are the principal causes of the disease.

Treatment. — This disease is not always curable. When once the obese temperament has been thoroughly established, the patient cannot expect more than a mitigation of his suffering by keeping within moderate bounds the tendency to increase of flesh. Persons known to have a tendency to obesity through hereditary predisposition, should endeavor to ward off the disease by the employment of preventive measures. The measures of treatment to be adopted for the cure of the disease, and also for its prevention in cases where there is a marked tendency to it from any cause, are such as will secure the following conditions: —

First, the diminution of the supply of food, especially fattening food, or that which has a tendency to induce obesity.

Second, an increased activity of the muscular tissue, thus creating a demand for food for the legitimate purpose of replenishing waste.

Third, the increased formation of red blood corpuscles, which are deficient in the most common forms of obesity.

Fourth, an increased supply of oxygen to the system, by means of which the surplus material which would otherwise be deposited as fat will be consumed and so removed from the body.

If such measures of treatment can be adopted as will secure the perfect realization of the four indications mentioned, cases of obesity in which recovery cannot be secured will be very rare indeed. The only difficulty is in securing the necessary conditions. The first of these may be secured in the manner already suggested; namely, by diminishing the amount of food taken by the patient, especially of those substances which have a tendency to produce fat. The mistake should not be made, however, of supposing that obesity is to be cured by starvation. The problem to be solved in the dietetic management of the disease is to diminish

the amount of surplus and useless material in the form of fat without at the same time lessening the patient's strength and undermining his constitution.

The starvation cure, while it will undoubtedly rapidly diminish the weight, at the same time reduces the patient's strength and induces a condition of anæmia, or poverty of the blood, which is very likely to result in a relapse into a condition far worse than the first, since obesity occasioned or accompanied by anemia is far more obstinate to cure than any other form. Consequently, those measures of treatment which greatly weaken the patient are much more likely to do harm than good, so that the remedy will prove far worse than the disease. The patient's diet should be reduced to a minimum in quantity, but it should be so carefully adjusted that sufficient nourishment shall be given him to maintain his strength. In extreme cases of obesity the restricted diet may be employed for a very short period; certainly not sufficiently long to in any very great degree weaken the strength of the patient. The regulation of the quality of the diet is of fully equal importance with the restriction with reference to quantity.

The following articles of food, on account of their tendency to increase fat, should be entirely forbidden: Butter, cream, fats of every description, rich sauces, pork, goose, duck, game, pastry, ices, raisins, dates, figs, all kinds of sweet and preserved fruits, nuts of every description, and all excess in the use of starchy, fatty, and saccharine articles of food.

The following articles may be eaten occasionally, but should be taken sparingly: New or unskimmed milk, eggs, potatoes, carrots, parsnips, and most other vegetables, rice, and buckwheat.

The articles in the following list, and those of a similar character, should form, almost exclusively, the diet of a person suffering with obesity: All kinds of green vegetables, such as asparagus, cabbage, green peas, beans, and spinage; and acid fruits, such as lemons, sour oranges, sour apples, and currants. Of the grains, cracked wheat, graham flour, rye, and oatmeal in moderate quantities, may be eaten. Meat should be used in moderation, the best varieties being venison, chicken, trout, and lean beef wholly free from fat. All the articles of food mentioned should be cooked entirely without the use of either fat or sugar. Very moderate quantities of salt should be employed. Tea, coffee, chocolate, and cocoa should be entirely interdicted, as also

should all kinds of alcoholic drinks, and stimulants and narcotics of all kinds. The idea that animal food is the diet *par excellence*, and that articles of food of this class may be taken in almost unstinted quantities without harm, is a very mistaken one. This statement is based upon the following facts :—

First, food of an exclusively albuminous character is capable of forming fat and thus contributing to the production of obesity. This is true, however, only when it is taken in excessive quantities, as has been shown by numerous experiments upon animals.

Second, the use of large quantities of animal food favors the increased production of urea and the retention in the blood of the excrementitious principles, which, as previously remarked, are among the most potent causes of the many grave effects which result from obesity, particularly the great liability to inflammatory affections, fevers, rheumatism, and gout. In not a few cases in which an exclusive animal diet has been adopted in this disease, the patient has found himself in a much worse condition from the injurious effects of his clogging and stimulating diet than that occasioned by the original disease. This we regard as a very important point to be kept in mind in the treatment of obesity, on account of the wide-spread and popular character of the error and the serious evils resulting from it.

While the amount of solid food should be reduced to the minimum quantity, as before remarked, the fluid portion of the diet, at least if pure water be the only drink, may be increased to any extent required by the desires of the patient. It is even advisable to urge upon the patient the importance of drinking daily considerable quantities of pure water, preferably cold water, as warm drinks are not to be recommended in this disease on account of their tendency to increase the activity of the skin, which is already abnormally active. From six to ten, or even more, glasses of water may be taken each day with benefit, unless there is a marked disturbance of digestion of a character to contra-indicate the taking of so large a quantity of fluid. The object of this measure is to increase tissue change by increasing the fluidity of the blood. The efficiency of water-drinking as an agency for this purpose has been fully dwelt upon elsewhere.

The patient should be encouraged to take exercise to the full extent of his ability. It would, of course, be useless to recommend to persons advanced in years and excessively corpulent to engage in any very active or violent physical exertion. Such a recommendation

might, in extreme cases, even prove fatal by occasioning excessive action of the heart or congestion of the brain, the results of which might be sudden paralysis of the heart on account of its weakened condition, or apoplexy through rupture of a blood-vessel in the brain. There are very few curable patients, however, even those who are the most remarkable specimens of obesity, who are unable to walk, at least for a short distance, and these should be urged to take as much exercise of this sort each day as they can endure, not of course attempting too long walks at first, nor continuing the exercise sufficiently long to produce very great exhaustion, but repeating it at sufficiently short intervals to secure the largest possible amount of exercise each day. For younger persons, those who suffer in a less marked degree, swimming, rowing, and the practice of gymnastics, may be recommended as a particularly efficient mode of exercise, as it brings into action the muscles of the upper as well as of the lower extremities and also those of the trunk. Only the lighter kinds of exercise should be taken, especially at first, but this should be done regularly and systematically, if possible under the eye of a tutor, at least at first, so as to secure thorough and methodical exercise of the whole muscular system.

Hippocrates recommended vigorous exercise as a sovereign remedy for excessive fatness. He also made what seems to us a very sensible suggestion, namely, that obese persons should accustom themselves to light, thin clothing in winter as well as in summer and the practice of exposing the uncovered body for a considerable length of time every day to the free action of cool air. By the adoption and faithful application of the hygienic measures already suggested, the great majority of fat people may reduce themselves to reasonable proportions. Not infrequently, however, a considerable length of time may be required, but the patient should persevere, feeling sure that the course which he is pursuing is the wisest one which can be adopted, and will, in all probability, secure for him the best results which can be obtained. If the dietary suggested becomes so unpalatable that the appetite is impaired and the digestion is in danger of suffering, a slight modification may be made for three or four days or a week to give the patient a little opportunity to recover his appetite and enable him to enter upon his regimen again with renewed vigor. It is better to adopt a rigid dietary and then interrupt it at intervals of three or four weeks in the manner suggested, than to endeavor to follow continuously a more liberal regimen.

All cases of excessive corpulency, and especially severe cases, may be greatly benefited, and the chances for recovery greatly increased, by other measures of treatment in addition to those already mentioned. The most useful of these are frequent cold bathing and the employment in plethoric cases of powerful eliminative measures. A cold sponge or shower bath may be taken daily with benefit. It should be of short duration and taken in a warm room, and great care should be exercised to secure thorough reaction. In addition to this treatment, one to three vapor or hot-air baths and wet-sheet packs may be taken each week with benefit. When there is great inactivity of the liver and kidneys, daily fomentations over these organs and the wearing of the abdominal bandage will be found of very great advantage. The excessive tendency to sweat which is present in this disease, although a remedial process, sometimes requires checking on account of its weakening tendencies. For this purpose cold shower and sponge baths are indicated. Another excellent measure of treatment is daily sponging of the body with an astringent wash composed of one part vinegar to three parts of a decoction of sage, oak-bark, or some other mild astringent. The increased secretion of fat will also be checked by this method of treatment. Much may be contributed to the patient's comfort by bathing the parts most affected with equal parts of alcohol and water, by which the excess of sebaceous matter will be removed.

We are aware that we have devoted more space to this affection than the general opinion of its importance would justify; but this we have done on account of the fact that it is generally neglected by medical writers, and, as before remarked, is quite too commonly regarded as of too trivial moment to require serious attention except on account of its inconveniences. We cannot properly conclude this subject, however, without calling attention to two notorious evils. We refer to the tobacco cure of obesity and the numerous quack nostrums advertised and sold under the taking title of "Anti-Fat" remedies. With reference to the tobacco cure for corpulency, much might be properly said, but as we can say nothing better on the subject, we are glad to be able to quote the following excellent remarks by the eminent Prof. Immermann, of Bâle, which are worthy of special attention, coming as they do from a gentleman whose nationality is certainly not remarkable for antipathy to the weed: "While English and American physicians have celebrated tobacco-chewing as a very efficacious prophylactic against corpulence, and prescribed it, we can by no means coincide

in such a recommendation in any case, since this nauseous habit can scarcely in our opinion act in a limiting manner upon the deposition of fat, otherwise than by undermining the appetite, and by setting up a chronic dyspepsia, provoking a certain degree of marasmus. The same holds good, and perhaps in a still higher degree, of other customs and vices, such as the habitual use of the preparations of *coca* and *hashish*, and of *opium-smoking*, and above all, of that senseless and injurious *misuse of morphia in subcutaneous injection*, which latter fashionable vice is, as we know, at the present day so much in vogue that in some places, and especially in medical circles, it is looked on as quite the mode to be a slave to it.

The remarks of Prof. Immermann respecting the manner in which the excessive use of tobacco antagonizes obesity, apply with particular force to the numerous anti-fat nostrums advertised so extensively in the newspapers. We have known several instances in which these remedies have been employed by corpulent people, and in some cases with the most disastrous results. They are highly poisonous compounds, which destroy the digestion ; and though these means will in some cases reduce fat, it is at the expense of ruining the constitution.

That obesity may be successfully treated by means of the measures of treatment which we have outlined, we have many times demonstrated within the last twenty years. We have frequently seen patients under our care at the Sanitarium, lose seventy-five to one hundred pounds within a few weeks by a judicious course of treatment based upon the principles which we have briefly outlined. For further particulars relating to this disease the reader is referred to a paper by the writer, entitled, "How Not to Be Fat," which may be obtained of the publishers of this book.

SCROFULA, OR KING'S EVIL.

***SYMPTOMS.**—Skin eruptions, particularly about the head and face; enlarged lymphatics, especially those of the neck; nasal catarrh; thickened upper lip; discharges from the ears; enlarged tonsils; inflammation of the eyelids; capricious appetite; disease of the joints and bones.*

Respecting the real nature of the disease, it should be said that the results of the most thorough researches upon the subject seem to show that it consists rather in a peculiar susceptibility of the system to the morbid influence of disease-producing agents from without. This abnormal vulnerability, as the morbid condition may be called, is especially

manifested in the lymphatic glands, the affection of which, so characteristic of this disease, is supposed to arise from their absorption of irritating matters from the exterior of the body, as the reception of germs or the absorption of morbid matter from a diseased skin.

Causes.—Among the causes of scrofula should be placed first, hereditary predisposition; not that the disease itself may be inherited, as is generally supposed, but, as is the case with nearly all hereditary affections, there is a transmission from parent to child of a susceptibility to morbid influences by which this disease is characterized. It is probable that in a large share of the cases of scrofula, the disease is simply the result of development, through favoring circumstances, of tendencies inherited from consumptive or scrofulous parents. We believe, however, that the influence of bad hygienic conditions has been clearly shown to be so active an agent in producing this disease, and in developing an inherited tendency to it, that we may be justified in charging bad hygiene with by far the greatest number of cases of scrofulous disease. Among the most important errors in diet are those appearing in early infancy. Of this sort should be mentioned the feeding of children upon food not suited to their condition, such as vegetables and farinaceous articles, and particularly the evil custom in some countries, especially Sweden and Germany, of allowing young children to imitate the example of their parents in drinking coffee and beer. It has also been shown by evidence which is entirely worthy of credence, that scrofula, as well as consumption, is very often produced in human beings, especially children, through the medium of milk. A child may imbibe a scrofulous taint through being nursed by a scrofulous or consumptive mother or wet-nurse. The testimony is equally clear that this disease is not infrequently produced by milk from scrofulous or consumptive cows.

We believe that the large use of animal food, especially the use, as food, of animals in which scrofulous disease has been developed by confinement in stalls or close pens for the purpose of fattening, is one of the most serious dietetic causes of scrofula. Experiments have shown that the flesh, as well as the milk, of tuberculous or consumptive animals, will give rise to scrofula or consumption when eaten, even if cooked with a moderate heat. We are firmly convinced, not only by theoretical reasoning, but from practical observation, that of all dietetic errors, the use of swine's flesh is the most active cause of scrofulous disease.

We should not omit to mention, however, that eating between

meals, the use of pastry, candy, sweetmeats, and tidbits of all sorts, is also a prolific cause, not only in producing scrofula, but in developing scrofulous tendencies which might otherwise remain latent. Bad air, arising from overcrowding, deficient ventilation of living-rooms, sleeping apartments, and school-houses, must also be mentioned as a prolific cause of scrofula.

Uncleanliness of the skin, through want of frequent bathing, must also be a very common cause of this affection, or at least of the development of pre-existing scrofulous tendencies on account of increasing the liability to diseases of the skin. Certain diseases, as measles, scarlatina, diphtheria, typhoid fever, small-pox, and other affections of a grave character, frequently occasion the development of this disease.

It has been generally supposed that persons of a sanguine temperament, or those having light complexions, blue eyes, and light hair, are particularly liable to scrofula, and even that the peculiarities of the temperament mentioned are indications of a scrofulous tendency. It has been shown, however, by Phillips, from a careful collection of statistics, that this popular theory is absolutely groundless, and that persons of the very opposite temperament and characteristics from those named, are equally liable to the disease.

Treatment.— As remarked with reference to diseases of nutrition, the adoption of measures for the prevention of this disease or the development of the hereditary predisposition to it, is of the first importance.

Where there is the slightest ground for suspicion of the inherited scrofulous constitution, preventive measures should begin with the very earliest period of infant life. The greatest pains should be taken to secure for the child proper food. The natural food of infants is milk, and this should be given until the period arrives when the development of the teeth indicates the propriety of adding other food to the diet. If the mother is consumptive, or has at any period in her life manifested a scrofulous tendency, or if she is for any reason unable to supply her child with its natural food, a wet-nurse should be employed. Great care should be taken to secure for a nurse a healthy person whose family history is wholly free from scrofulous or consumptive taints. If such a nurse cannot be obtained, as is many times the case, cow's milk is the next best substitute; but care should be taken to secure milk from cows in a healthy condition. No milk should be given to the child until a careful investigation has first been made of the character

of the cow from which it is obtained, the condition under which it is kept, the character of the food, etc. Candy, and things of a like character, with which the friends of the little ones often supply them to their hurt, should be wholly interdicted. Excessive feeding should also be avoided, as scrofulous children often have a voracious appetite, and it is of the greatest importance that the digestive organs should be preserved in a healthy condition. Children should be very early accustomed to an abundance of fresh, pure air. Even when a very few weeks old, they should be taken out of doors and exposed to the fresh air and sunshine, in a moderate way of course, at first, and should sleep in rooms which are thoroughly ventilated, and not too warm, never being exposed for any length of time to a temperature above 70°.

The daily cool sponge bath is one of the most efficient means of combating the tendency to scrofula.

In general, it will not be necessary to employ water of a lower temperature than 80° or 85°, and it is best to begin with lukewarm water, making it gradually cooler from day to day. By this process the skin will be fortified against the invasion of the irritating elements which are supposed, as we have intimated, to produce scrofula and to develop any latent scrofulous tendencies. As soon as the child is of sufficient age, moderate exercise in the open air should be secured. It should be dressed in such a manner as to secure thorough protection of the entire body, so as to maintain the equilibrium of the circulation, and then be allowed to play in the open air as much as possible—several hours a day at least. Too warm clothing, and especially too warm covering at night, should be avoided, as by this means the system is rendered susceptible to climatic and atmospheric changes which have a marked influence in exciting scrofulous affections. The measures of prevention suggested should also be employed in all cases in which the symptoms of the disease are already present, as they are equally efficient when applied as curative measures as when applied for prevention.

Care should be taken to supply the patient with an abundance of the most wholesome, simple, and easily-digestible food, although equal care should be taken to avoid excessive feeding. All reducing measures should be avoided. Daily sun-baths, frequent inunctions with vegetable oil, tepid sponge baths daily or every other day, and, if possible, the tonic application of electricity, are especially indicated. If there is a feverish condition of the system, meat should be wholly avoided, and the dietary of the patient should consist prin-

cipally of fruits and farinaceous articles. Milk obtained from cows known to be healthy may be freely employed. The diet should in all cases be unstimulating and free from condiments and other irritating substances. Tea and coffee should be wholly abstained from. Caramel-cereal may be used to advantage as a harmless substitute for these beverages.

The German authorities recommend the wet-sheet pack and frequent cold bathing, the use of which is especially advocated by Schroth. We recommend caution, however, in the use of these active measures of treatment. We much prefer to employ such mild measures as the vapor or hot-air bath, administered at as low a temperature as will produce sweating, or the warm full bath, followed by the cool shower. The pack may be employed occasionally, however, with benefit. With reference to the use of water in these cases, the eminent Dr. Niemeyer remarks as follows: "In recent times the cold-water cure has earned for itself the most favorable reputation as a remedy for scrofula, and, indeed, a series of cases is on record, in which complete and perfect cures have been obtained by this means after all other modes of treatment had been applied in vain."

A few remarks should be made in this connection respecting the treatment of local affections incident to this disease. Scrofulous skin eruptions seldom require, in addition to the measures of treatment mentioned, the application of other remedial measures than those necessary for cleanliness, and the application of simple vaseline ointment or carbolated vaseline or zinc ointment. For scrofulous catarrh of the nose, the nasal spray is to be recommended as a means of applying antiseptic remedies such as are recommended for milder forms of catarrh.

For scrofulous sore eyes, the continuous employment of the hot spray two or three times a day will usually secure recovery after a time. For chronic discharges from the ears, a carbolic acid lotion composed of one part carbolic acid to three of glycerine or alcohol, and fifty of water, should be employed two or three times a day in the form of a douche, the mode of application of which is elsewhere described. After cleansing the ear, either with the boiled water or the carbolic lotion above described, it should be carefully dried with absorbent cotton, and then the canal should be packed full of powdered boracic acid, or equal parts of boracic acid and starch. We have succeeded in curing many cases of ear discharge which had resisted all previous

treatment for periods of from five to twenty years by the means suggested, and sometimes within so short a time as a week or ten days.

Enlarged lymphatic glands, particularly in the region of the neck, is one of the most common forms of scrofulous disease requiring treatment. The application of cold water in the form of a douche, is one of the most effective means of treating this condition. More certain results may be obtained, however, by the application of the alternate hot and cold douche. In very obstinate cases a surgical operation is required. The application of the galvanic current succeeds in a certain proportion of cases.

The bronchitis of scrofula should receive the most prompt attention as soon as its presence is discovered, as by this means it is possible to prevent the fatal consumption to which sufferers from this form of scrofula are especially liable. The same importance is attached to the prompt and persistent treatment of derangements of digestion, which have a decided tendency to the production of mesenteric consumption.

HEMORRHAGIC DIATHESIS, OR HEMOPHILIA.

SYMPTOM.—Persistent bleeding occasioned by a slight cut, puncture, or laceration of the skin.

This is a peculiar affection, the exact nature of which is not known It is, however, known to be of an hereditary character, whole families frequently being affected by it, and the condition often being transmitted through several generations. A person who is affected by this constitutional tendency to hemorrhage, in common parlance termed a "bleeder," is liable to death occasioned by even the slightest injury. The extraction of a tooth or a small cut may give rise to such persistent and irrepressible bleeding that the patient's life may be drained away in the course of a few days. Most patients suffering with this affection die young, very few surviving childhood. If, however, the patient lives to old age, as is sometimes the case, the tendency to hemorrhage diminishes, and may often disappear altogether.

Treatment.—There is no known remedy by which the constitutional tendency may be removed. Consequently, preventive measures are by far the most important. These consist almost exclusively in protecting the individual afflicted by this disease from the occurrence of accidents of a character calculated to excite hemorrhage. Such persons should not be allowed to use tea or coffee or other hot drinks, on account of

their relaxing effects. The most effective remedies for hemorrhage when it occurs are prolonged and steady pressure, and cauterization with a heated iron. All other means should be tried, however, in conjunction with this.

SCURVY.

SYMPTOMS.—Great debility; lassitude; mental depression; sunken eyes; pain in the limbs and joints; pallor; livid lips; sore mouth; bleeding gums; blood spots in the skin; nosebleed; hemorrhage from the lungs and bowels; shortness of breath; scurvy condition of the skin.

This long list of symptoms by no means includes all of the morbid conditions observable in this disease. As they are the leading symptoms, however, we need not increase the length of the enumeration. The disease is usually of a chronic character, the condition of the patient becoming successively worse so long as the disease continues, finally resulting in the inflammation of the internal organs, particularly the pericardium and pleura. Dropsy of the chest is also frequently observed. The patient finally dies from exhaustion and general dropsy, inflammation of some one of the internal organs, or hemorrhage from the bowels.

Causes.—Scurvy is usually attributed to the restriction for a long time to salt meat and bread without fresh vegetables. So many cases have been observed which have been produced from other causes, that salt is no longer considered as the only agent in causing the disease. It has been known to break out with very great virulence in consequence of exposure to cold, especially to cold and wet, and also from prolonged exposure to heat. It has also been known to occur in consequence of great exhaustion, prolonged melancholy, and similar causes. In Northern countries, particularly Russia, a form of disease known as land scurvy is common among people who live in cold, damp cellars, and are destitute of the comforts of life. An eminent English physician has lately called attention to the fact that scurvy is not infrequently produced in women of the lower classes in some parts of England in consequence of the use of tea. It thus appears that this disease may be produced by the gross neglect of almost any principle of the laws of hygiene.

Treatment.—About all that is required to be done in the treatment of this disease is to adopt such measures as are useful in its prevention, that is, to place the patient under good hygienic conditions. Sailors and others who have been long confined to the use of salt meat, and deprived of vegetables, should have an abundant supply of fresh vegetables, par-

ticularly cabbage, potatoes, and articles of this class. Fresh fruits are equally valuable. Lemons, oranges, and other sour fruits, are also of special service. Those in whom the disease is due to the use of tea and other stimulants should of course abandon the use of the harmful agents at once, and adopt a rational dietary. It is a remarkable fact that immediately upon the removal of the causes of scurvy, the person suffering from this formidable disease begins to show evidences of improvement, and in course of time is almost certain to recover, although suffering from the disease in its most severe form.

PURPURA.

SYMPTOMS.— Purple spots varying in size from a pin-head to a sixth of an inch in diameter. The spots do not disappear under pressure, being due to extravasation of blood in the skin. They are first bright red in color, but soon become darker and gradually fade to a brownish shade.

Under the head of purpura, which is more properly a symptom than a disease, are included quite a number of different maladies. Purpura is associated with pneumonia, typhus fever, measles, scarlet fever, small-pox, rheumatism, cancer, tuberculosis, Bright's disease, scurvy, locomotor-ataxia, inflammation of the spinal cord, heredity, whooping-cough, epilepsy, and with badly-nourished and delicate infants, especially girls, in whom it sometimes assumes a hemorrhagic form, being accompanied by hemorrhages from the mucous membranes, and is often rapidly fatal. What is known as "black measles" is simply a malignant form of measles, in which purpura occurs as a symptom.

Treatment.—The majority of cases recover without treatment. In purpura unaccompanied by other diseases, death seldom occurs, recovery usually taking place after a time by the efforts of nature alone. Drugs are found to be of little if any value in these diseases. The general system must be built up, the quality of the blood improved by good food, abundance of fresh air, tonic baths, and particularly cool sponging of the whole body and alternating cold and hot sponging of the affected parts. When accompanied by rheumatism, or when occurring in connection with measles, scarlet fever, or small-pox, it is of course necessary to administer the treatment which is best adapted to the condition of which the purpura is a complication. Purpura occurring in cases of this sort indicates a very grave form of disease in connection with febrile disorders. Cold application as a means of reducing temperature should be avoided.

The occurrence of purpura usually accompanies a high temperature. It is often very obstinate. It has, however, in our experience, yielded best to the measures suggested, especially when employed in connection with massage, electricity, a very nutritious diet, especially adapted to the condition of the stomach, and a suitable regimen.

MYXŒDEMA.

SYMPTOMS.— Swelling or puffiness of the skin without pitting on pressure; dryness; roughness; making features coarse and broad; slowness of thought and movement; cloudy memory; headache; mental failure; sometimes illusions and hallucinations, finally resulting in dementia; gait heavy and slow; temperature subnormal; sometimes albuminuria; sugar is also sometimes found in the urinal secretion; atrophy of the thyroid gland.

This peculiar disease occurs much more frequently in women than in men. The writer has met among many thousands of general cases but two cases of this disease in men, but a much larger number in women. The cause is supposed to be atrophy or disease of the thyroid gland. It occurs in a certain proportion of cases in which the thyroid gland has been removed. The thyroid gland probably supplies some necessary secretion to the blood whereby the nutritive processes of the body are regulated. The primary seat of this disease is probably in the nervous system.

Treatment.— Success has been claimed for the use of extract of the thyroid gland of a sheep, which has been used quite extensively in the treatment of this disease. The writer has found "rest-cure" accompanied by massage, electricity, and tonic baths, useful in arresting the disease and securing marked improvement in the condition of patients suffering from it.

DIABETES MELLITUS, OR TRUE DIABETES.

SYMPTOMS.— Excessive quantity of urine containing sugar; emaciation; great thirst; dryness of the skin; voracious appetite; drowsiness or coma.

The characteristic feature of this disease is the discharge of enormous quantities of pale urine containing sugar. As much as five or ten quarts of pale, sweetish urine is sometimes discharged in a single day. The presence of sugar in the urine may be demonstrated by the taste, or by means of chemical tests. The latter means is of course the most reliable. The test is so simple that almost any one can apply it. Place in a small test-tube or vial two or three teaspoonfuls of the urine to be tested, and

add about an equal quantity of a strong solution of caustic potash. Now add a strong solution of sulphate of copper drop by drop until the blue coagulum or precipitate which is formed is no longer dissolved. Then heat to the boiling point. If sugar is present the blue color will be changed to yellow or orange.

All the symptoms mentioned follow each other as the disease advances. The patient finally dies from exhaustion, or from inflammation of the bones or of some internal organ, which is very apt to occur. In many cases the patient dies of consumption or inflammation of the lungs. The disease usually lasts from one to three years, though under favorable circumstances it may continue for a much longer time. This disease is not a malady of the kidneys, as is popularly supposed, although sometimes accompanied by kidney disease. It is a condition of the system in which the tissues fail to consume the sugar of the blood as fast as it is formed, so that the kidneys are compelled to remove the surplus. This accounts for the great increase of urine.

Causes.—Little is known concerning the real cause of diabetes, and still less satisfactory is the knowledge which we possess respecting the real seat of this disease, notwithstanding the numerous experiments upon animals and almost numberless observations of human beings which have been made with direct reference to the pathology of the disease. It has been quite well established, however, that the most frequent causes of this malady are exposure to cold and wet, physical violence, concussions of the whole body, injuries to the brain and nervous system, mental exhaustion, gluttony, and especially the use of large quantities of sugar. It is probable that dietetic errors are the principal cause of this disease. It has been claimed that diabetes is the result of the use of an exclusively vegetable diet. That this is not the case, however, is clearly shown by the fact that the disease is no more frequent among the majority of nations which subsist almost wholly upon vegetable food than among those that employ diet of the opposite character. A strong argument against this theory is also found in the fact that, in the numerous dietetic experiments which have been made upon animals and human beings in which they have been required to subsist for long periods of time upon a purely vegetable diet, this disease has never been produced. On the other hand, the eminent Dr. Berrenger-Ferroud has given an account of the occurrence of diabetes in an ape, in which he claimed that the only cause of the disease was the attempt to accustom the animal to the addition of

a proportion of animal food to his natural diet of fruits and grains. Numerous experiments, however, have shown that when large quantities of sugar are taken into the system, sugar may be found in the urine after a few hours. A predisposition to the disease is hereditary. It has been most frequently observed in females.

The direct cause of the appearance of sugar in the urine is the failure of the system to consume the sugar which is produced by the liver. The blood ordinarily contains from 1½ to 3 parts of sugar to 1000 parts of blood. When the amount of sugar in the blood rises above this proportion, the excess appears in the urine. There is known to be a close relation between diabetes and certain other diseases, as obesity, rheumatism, and gout. These diseases are also dependent upon deficient oxidation.

Treatment.—The most recent investigations concerning this disease, recognize three forms of diabetes, which may be designated respectively as grave, moderate, and simple. The grave form is never curable. The most that can be done is to prolong the patient's life. No known form of treatment or diet will exert any considerable influence upon the amount of sugar eliminated.

In the moderate form of the disease the amount of sugar eliminated is less than in the grave form, and rapidly diminishes under the influence of proper diet and treatment, although it usually does not disappear entirely. When neglected, this form of the disease is likely to develop into the grave form, thus rendering the case hopeless.

In the mild or simple form of the disease, the amount of sugar daily eliminated in the urine is relatively small, and usually rapidly and entirely disappears under the influence of a proper regimen.

In the treatment of diabetes there are two things to be accomplished: —

1. To lessen the introduction of sugar and sugar-producing material into the system.

2. To increase the amount of sugar consumption in the system by oxidation.

The first of these objects is to be obtained by a regulation of the dietary. The plan formerly adopted, of confining the patient to a strictly meat diet, is not to be recommended, and is now recognized as being often dangerous even to the extent of rapidly producing fatal results. This is especially true in the worst forms of the disease, in

which a strictly meat diet would seem to be especially indicated. Death results in these cases, from the accumulation of tissue poisons within the body, resulting in drowsiness, and finally a comatose condition and death. These poisons are always present in meat in considerable quantity, consequently a flesh diet will increase the natural danger from the disease.

In curable cases it is rarely necessary to withhold absolutely all starch or sugar-forming elements from the dietary, although it is important that sugar should be excluded and that the amount of starch taken should be restricted. The dietary of a diabetic patient should consist chiefly of green vegetables, such as greens, green peas, beans, lettuce, cabbage, yellow beets, asparagus, cucumbers, and acid fruits. Kumyss and sour milk or buttermilk may also be freely used. Bread may be taken in small quantities.

Of special value is gluten or diabetic bread. The most reliable gluten bread with which we are acquainted is that made by the Sanitarium Health Food Co., Battle Creek, Mich. We have succeeded in devising a form of kumyss which is made without cane sugar and without yeast, and from which the natural sugar of the milk is removed. This kumyss is especially useful in cases of diabetes. It can be obtained from the Sanitarium Health Food Co., Battle Creek, Mich., or through druggists in the large cities.

Water may be taken in moderate quantity. It is required as an aid to the elimination of the surplus sugar.

The second object of treatment is to be obtained by inducing the patient to take as large an amount of exercise in the open air as possible. Walking, horseback riding, and especially bicycle riding, are of great value as a means of consuming the surplus sugar, both through the exercise taken and through the increased absorption of oxygen induced by active exercise. A warm bath two or three times a week, followed by oil rubbing, is of value in these cases. A cool sponge bath, or, better, a cool shower bath following a short hot bath, may be advantageously administered daily. Cases of this sort should be placed under the care of an intelligent physician, and may be best treated in a well-equipped sanitarium. A careful examination of the urine should be made weekly to determine the amount of sugar present, and both the diet and the exercise should be regulated by the results of these examinations.

It is a good plan in the dietetic treatment of diabetic patients to follow the method suggested with reference to the dietetic treatment of obesity; namely, to employ a strict diet for several days or two or three weeks, and then allow the patient to take a little more liberal diet for a few days, so that the appetite may not be so greatly impaired as to cause much decrease of the patient's strength. A diabetic patient should not be deprived of fluids, but should be cautioned to control the desire for drink within as reasonable limits as possible, and especially to take small quantities of fluid at a time. The intolerable thirst will often be removed by holding bits of ice in the mouth. The great discharge of fluid from the body is not the result of excessive drinking, but is the cause of the great thirst, which is simply an expression on the part of the system of the lack of water in the blood. Consequently the intolerable thirst by which this disease is characterized is as much a real demand for fluid as is the thirst experienced in health.

In addition to the dietetic measures recommended, the most that can be done in many cases is to employ all suitable measures for securing and maintaining a general healthy condition. This should be done with the full understanding, however, that in quite a large proportion of cases of persons suffering from this disease the most that can be done is to mitigate the symptoms and prolong the patient's life, as a radical and permanent cure is rarely effected.

In conclusion, we would call attention to the fact that a sudden and very great decrease in the amount of urine should be regarded as of unfavorable import when it cannot be fairly attributed to treatment. This fact is well illustrated by the following case, observed while this work was in press: We were suddenly called by telegram to see a patient in consultation at a distance who had suffered for several years from diabetes, passing about two gallons of urine daily. We found the patient in a state of unconsciousness, the pupils widely dilated, pulse barely perceptible, in which condition she had been for about thirty hours. Upon inquiring into the history of the case we found that three or four days previously she had had a severe ague chill, since which time she had been rapidly failing until she had reached the condition in which we found her. Upon making inquiry of her medical attendant concerning the condition of her bladder and the amount of secretion, we found that within the last thirty-six hours not more than thirty ounces had been formed, which was less than one-tenth of the usual quantity. The other nine-tenths, of course, which remained in her system, had so poisoned the nerve centers

as to bring the patient into the comatose condition in which we found her. The patient, finding the quantity of urine about that usual in health, had not compared it with the amount she had been habitually secreting up to the time of her sickness, and hence had failed to discover the real cause of the sudden change in symptoms. In a case of this kind the treatment suggested should be applied promptly and thoroughly, namely, alternate hot and cold applications to the small of the back over the kidneys, and packing the patient with hot bottles, bricks, etc., to induce profuse perspiration. The patient should also be given hot teas, or warm drinks of other kinds in abundance, so as to encourage the sweating process. By this means the poison may be eliminated from the blood, and life maintained until the kidneys become able to resume their functions.

DIABETES INSIPIDIS.

SYMPTOM.—Gradually increased quantity of pale urine, free from sugar.

Almost the sole symptom of this disease is that mentioned. The urine differs from that of diabetes mellitus in being entirely free from sugar. The amount of urine produced by patients suffering from this disease is almost incredible. The usual quantity is from three to ten quarts, and cases are recorded in which so large an amount as between ten and eleven gallons has been produced in twenty-four hours. The writer has now under observation, a case in which the daily amount excreted is seven to eight gallons. This disease is generally regarded as one of the mildest from which a person may suffer. It gives rise to no marked disturbances of the system, and has, in some instances, been tolerated without seeming injury to the system for fifty years.

Causes.— In addition to the hereditary predisposition to the disease the most frequently observed causes are injuries to the spine, chronic diseases of the brain and spinal cord, violent emotions or excessive physical exertion, the use of alcohol, and the drinking of large quantities of cold liquids. The prominent symptom of the disease is now generally believed to be due to derangement of some part of the nervous system, probably of certain nerve-centers located in the base of the brain.

Treatment.— M. Bouchardat of Paris, an eminent French physician, states that hygienic treatment is essential to success in the management of cases of this disease. All the habits of the patient should be regulated strictly in accordance with the laws of hygiene. Exercise should be

taken regularly and to as great an extent as admissible by the strength of the patient. Warm clothing should be worn and great care should be taken to prevent chilliness. The diet should be simple and wholesome. Stimulating condiments of all sorts should be carefully avoided. Fruits and grains constitute the best diet for patients suffering with this disease. Nearly all fruits, grains, and vegetables may be eaten without injury, with the exception of tomatoes, which should be avoided. The use of asparagus and beans should also be interdicted when pain in the region of the kidneys or a deposit in the urine is observed after eating them. Tea, coffee, chocolate, alcoholic beverages, and all other stimulating drinks, must be wholly discarded. Fluids should be taken in as limited quantities as possible to avoid too great suffering on the part of the patient. Iced water, ices, and all cold drinks, should be discarded. It is better to take fluids warm in this disease, as by this means the action of the skin will be encouraged and that of the kidneys lessened. Hot lemonade taken without sugar is an excellent means of allaying the very severe thirst present in this disease. Such remedial measures should be employed as will induce energetic action of the skin. For this purpose a cold sponge followed by vigorous rubbing, or the rubbing wet-sheet, should be taken daily. In severe cases, a pack, the Turkish, hot-air, or vapor bath should be taken once or twice a week, and may be employed even oftener than this if the patient is under careful medical supervision and is wholly devoted to treatment. Dr. Gurltz, an eminent German physician, highly recommends the use of galvanism applied to the spine and especially to the region of the kidneys. Sun-baths, friction of the surface of the skin with the dry hand, a woolen cloth, or soft flesh-brush, and all other means for increasing the activity of the skin and thus lessening the work imposed upon the kidneys, should be employed.

DISEASES OF THE DIGESTIVE ORGANS.

The diseases of the digestive system, aside from the teeth, may be roughly divided into two classes, mechanical and functional. The most common of all diseases of the organs concerned in digestion is caries of the teeth, which may indeed be said to be the most common of all human maladies. This affection, due to the action of germs upon the teeth, we shall not undertake to deal with here, however, as it is mentioned elsewhere in this work.

As this work does not undertake to be exhaustive but merely helpful and suggestive, we may perhaps, without dwelling too much upon details, profitably devote a little space to the consideration of the mechanical disorders of the viscera of the abdomen, a subject which has been little understood, and has received almost no attention until within recent years. Through the labors of Glenard and Trastour, of France, and perhaps the author may mention also his own researches made in relation to this subject, a great flood of light has within the last decade been thrown upon a class of disorders previously practically unknown, and a most perplexing and almost inexplicable tangle of symptoms.

The organs which occupy the abdomen, most of which are concerned in digestion, are the stomach, liver, pancreas, spleen, colon, and small intestines. The liver, spleen, pancreas, and stomach are all located above or at the waist. The transverse colon lies at the waist, the point of junction of the ascending and transverse colon on the right side dropping a little below the line, while the point of conjunction of the transverse with the descending colon at the left side rises considerably above the waist line. The kidneys lie just at the waist. It is noticeable that the organs of the greatest weight and functional importance are located at or above the waist.

How are all these important organs held in position? Although fitted together with the nicety of an articulation, the viscera are certainly not held together by anything corresponding to the firm ligamentous bands which unite the osseous elements of a joint. The principal means by which these organs are held in position is the contractile power of the abdominal muscles. Downward displacement of each and all of these organs has been, by careful

observation, found to be much more common than has been generally supposed. To this condition Glenard has given the general name of *enteroptosis*. Special terms have also been employed to designate the condition of prolapse affecting the different organs, as gastroptosis, nephroptosis, etc.

Careful attention has also been given to the study of the particular symptoms which arise from these forms of visceral displacement. French medical literature is particularly rich in the discussion of this subject, although as yet little is known about it on this side of the Atlantic. Within the last ten years, the writer has made very extensive studies of the same subject, confirming the observations made by foreign medical authors, and has become fully convinced that displacement of the viscera of the abdomen is, in both men and women, responsible for a very large share of the distressing symptoms from which many adults of both sexes complain.

An injury inflicted upon the body at its central portion by constriction of the waist, attacks the very citadel of its strength and vigor, the stomach and its associate organs constituting the headquarters for the supply of force and energy for the whole system. It is doubtless for this reason that the great abdominal brain, the largest collection of nerve matter in the sympathetic system, is found in such close relation to the stomach. Lying, as it does, exactly in the plane of the waist, any abnormal pressure here must act directly upon this great center of reflex nervous activity.

Nature has so placed each internal organ that it can do its work most efficiently; and the studies of the results of visceral displacement which have been made by eminent scientific physicians, have shown that to morbid conditions of this sort may be fairly attributable the most serious and not infrequently the most obstinate disturbances of some of the most important vital functions, and through them, of all the other functions of the body.

Prolapse of the Stomach. — This condition may give rise to a great number of reflex symptoms in consequence of the pulling of the organs on the solar plexus and the consequent irritation thereby produced, and also to a much larger and generally more serious complication of symptoms resulting from the disturbance of the digestive functions, which is a necessary consequence.

A prolapsed stomach is necessarily a weakened and crippled one. The left, or cardiac, portion of the stomach, being less firmly held in place than the pyloric portion, suffers most from the displace-

ment. It is not an uncommon thing to find the lower border of the stomach two or three inches below the umbilicus, whereas its normal position is two inches above this point; and the writer has encountered a number of cases in which the stomach was prolapsed to a much greater extent, the lower border being found more than five inches below the umbilicus. In consequence of this abnormal position of the stomach and the changed relation of the cardiac and pyloric portions of the organ, the food is retained within the stomach for too long a time, the organ not being able to empty itself promptly. This lack of muscular activity, or motor efficiency,

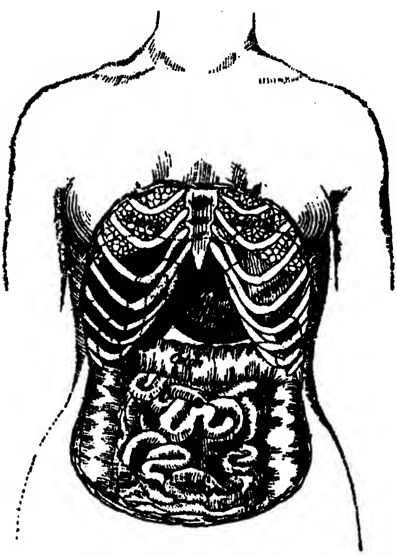


Fig. 274, a.

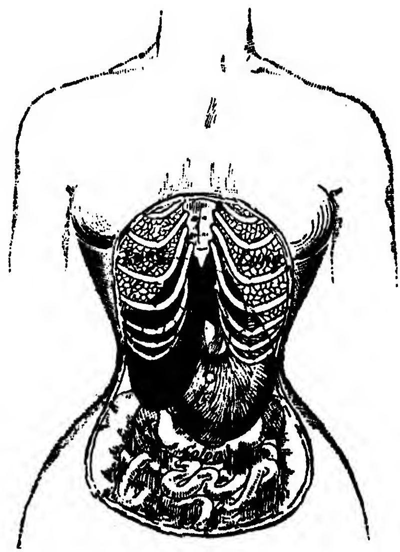


Fig. 274, b.

as it is more technically termed, is also in part due to the weakening of the muscular walls of the stomach, due to the dilatation which nearly always accompanies this condition. The food, being too long retained in the stomach, undergoes decomposition, fermentations of various sorts; putrefaction of proteids often takes place, giving rise to numerous poisonous substances, which are of course absorbed into the blood, and, circulating through the body, produce a general state of poisoning and disease. The condition commonly known as biliousness is directly attributable to this state of the stomach. If the liver is at all involved in this diseased condition, it is only because of its being overworked in its attempt to destroy

the enormous quantity of ptomaines and other poisonous substances produced in the stomach and absorbed into the blood. Migraine, nervous or sick headache, neuralgia, gastralgia, spinal irritation, backache, sideache, pain in the region of the heart, pain under the shoulder-blade, pain in the region of the liver, palpitation of the heart, giddiness, sudden attacks of "goneness," disturbance of hearing, vision, and taste, nervous sensations of various sorts experienced in the arms and legs and different parts of the body, fidgets, coldness of the hands and feet, sweating of the arms, hands, and soles of feet, and a great variety of other symptoms indicating functional derangement, are due to this condition. In addition to these may also be mentioned such grave organic diseases as degeneration of the liver and kidneys, particularly Bright's disease; also jaundice, either with or without the formation of gall-stones; intestinal catarrh; epilepsy, and many other grave conditions. Some eminent physicians have expressed the opinion that many constitutional maladies, such as consumption and rheumatism, are directly dependent upon the general state of the systemic conditions arising from prolapse and dilatation of the stomach. The stomach becomes a hot-bed for germs, in which is developed a great variety of mischief-making microbes. The food taken into the stomach is at once infected and becomes a seething mass of fermenting, decomposing material, which, when finally worried out of the stomach into the small intestine, gives rise to a great variety of distressing symptoms in the region of the alimentary canal, often producing pseudo-membranous catarrh and other obstinate maladies. The presence of bile in the stomach is not infrequently the result of this prolapsed or diseased condition, the pyloric orifice being so dragged down with the rest of the stomach that the bile flows into the stomach instead of in the opposite direction, in which it is naturally led by gravity.

Prolapse of the Colon.—This condition is one which invariably accompanies prolapse of the stomach, the colon being pushed down by the stomach, which is connected with its upper border. One of the most frequent consequences of prolapse of the colon is accumulation of fecal matters in this portion of the alimentary canal. This accumulation is most common in the descending colon, particularly in the region of the sigmoid flexure or the rectum, and is frequently found in the cecum, sometimes in the transverse colon. I have often found the transverse colon several inches below the umbilicus,

and sometimes immediately below the site of the incision, when opening the abdomen for the removal of ovarian tumors or other products of disease.

In an abdominal section a few years ago, I found the omentum packed away in the pelvis, the lower border of the transverse colon lying at a point an inch above the pubes, and the stomach only a little higher. In this instance it was necessary to disentangle the mesentery from the other organs before the colon could be returned to position.

The consequences of such a condition are dilatation and ultimate complete loss of activity of the colon, and of constant poisoning resulting from the absorption of too long retained intestinal contents.

Prolapse of the Liver.— This condition is a much more common one than is generally supposed. A prolapsed liver is very likely to be taken for an enlarged liver, as the organ rolls forward in prolapse, thus spreading out a broader surface for examination. A prolapsed liver can usually be pushed back into place, however, which of course cannot be done in case of real enlargement of the liver. A prolapsed liver, like a prolapsed stomach, is necessarily more or less crippled in its functions. It is likely to become the seat of chronic or acute inflammation; and not infrequently the possessor of such a liver suffers from gall-stones, a condition which is shown to be much more frequent in women than in men, doubtless because of the greater frequency of constriction of the bile duct, resulting from the practice of tight lacing, so common among civilized women.

Prolapse of the Kidney.— This condition consists of three degrees: palpable kidney, which can be readily felt; movable kidney, in which the organ can easily be moved an inch or two from its normal place, and when the patient stands upon the feet, falls down out of position; and floating kidney, in which the organ is constantly out of place, falling so low in the abdomen as to reach the level of the umbilicus. These conditions are commonly accompanied by pain. The pain runs down toward the bladder, and is very likely to be attributed to ovarian disease. Much greater inconvenience is, however, likely to result from the displacement of this organ. Several cases have come under the care of the writer in which the displaced kidney became the seat of calculus. In two instances the calculi were so large that it was necessary to resort to surgical procedure. In one case the calculus alone was removed and was found to be larger than a full-sized almond; in the other case the calculus

was much larger, weighing 4⅛ ounces. The whole kidney was filled with abscesses, and was so disorganized that it was necessary to remove the entire organ. Both patients made good recovery, but death has doubtless resulted in more than one case in which proper surgical relief could not be obtained. In Fig. 274, c, is shown the position of the stomach, colon, and kidney in one of these cases.

Treatment.— The treatment of visceral prolapse consists, first, in securing a certain degree of immediate relief by the application of an appropriate abdominal supporter. A simple cloth bandage eight or ten inches wide, applied tightly about the lower abdomen, is usually very helpful in cases of this sort. A silk or cotton elastic bandage is better in most cases; but the same sort of bandage is not suitable for all. The writer has constructed a special form of bandage which he finds of great service in these cases, especially those which are not relieved by ordinary bandages.

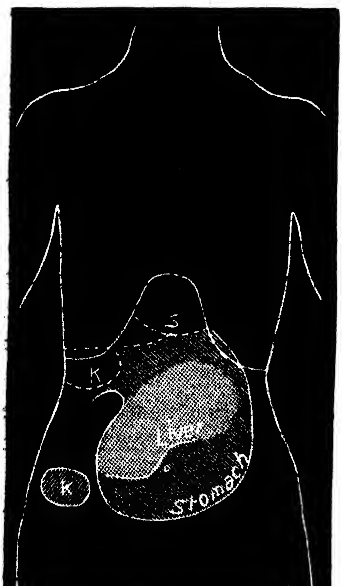


Fig. 274, c.

Permanent relief is to be obtained, however, only in development of the abdominal muscles. This is accomplished by exercise, Swedish gymnastics (see Figs 233–238 and 240–245), for suitable cases, active Swedish movements, and especially by the application of the sinusoidal electrical current.

Digestive disorders must receive attention in the special adaptation of the diet to the condition of the stomach. Meats of all sorts must be discarded. The same is true, also, of many forms of animal food Cheese, fish, shell-fish, and in some cases, even milk must be prohibited. The stomach being unable to easily empty itself, it is important that the food should either be very thoroughly disintegrated or broken up before it is eaten, or that it should be masticated with the greatest thoroughness possible. It is also important to avoid the use of much fluid at meals, in order to enable the stomach to absorb liquids properly. The use of the stomach-tube, for a short time at least, is essential in many cases. We have found granola, granose, and

other health foods manufactured by the Health Food department of the Battle Creek (Mich.) Sanitarium, of very great service in the treatment of some thousands of cases of this sort. In many cases it is also necessary to assist the stomach in resisting the tendency to fermentation. This may be done by the proper use of antiseptic measures. Charcoal is one of the best of these, and a mixture of charcoal and sulphur is of great use in these cases. In some cases, this or some similar remedy must be used habitually. The Modern Medicine Company, Battle Creek, Mich., have succeeded in combining these remedies with suitable digestive agents in the form of a tablet which is very convenient to take and is even palatable, thus overcoming one of the chief objections to the use of the remedy.

In extreme cases of prolapse of the colon, the large warm water enema, or coloclyster must be used daily or every other day. In the majority of cases, however, this use of water is essential only for a short time and may be gradually discontinued, decreasing the quantity of water and moderating the temperature until only a small quantity of cold water is employed. The injection of oil or glycerine at night or before breakfast is beneficial. The use of granose, a food remedy for these cases, with abundance of fruit, is of great service. An eminent bacteriologist has shown that granose has the remarkable property of entirely ridding the stomach of germs.

Methods of Precision in Examination of the Stomach.— The various changes in the digestive processes resulting from disease have been made a subject of diligent investigation in recent years, and at last, means have been discovered by which the digestive process can be studied with a degree of accuracy which secures results hitherto unattained and unattainable. The method of procedure is to give the patient in the morning, while the stomach is entirely empty,— neither foods nor fluids having been taken since rising,— a test meal consisting of two ounces of bread and eight ounces of water. At the end of an hour, a small and very soft and flexible rubber tube is given to the patient, who, placing one end of the tube in the mouth, swallows it into the stomach. By this means a portion of the digesting food is removed from the stomach and submitted to careful chemical tests and minute analysis. The stomach is, as it were, surprised in the midst of its work, and thus the secrets of the digestive process are unlocked, and facts of the greatest value learned. The report of the investigation made of the fluid thus obtained gives precise and accurate information in relation

to the quantity and quality of digestive work done in the digestion of proteid or albuminous and farinaceous substances, the only food elements which are digested in the stomach. (For further explanation of this new method, see Appendix.)

After having examined more than five thousand stomach fluids by this method, we feel thoroughly satisfied that it is not only wholly reliable, but is the only satisfactory method of obtaining a foundation for the rational treatment of the disorders of digestion.

DISEASES OF THE MOUTH.

CATARRH OF THE MOUTH.

SYMPTOMS.—ACUTE: ***Burning; tenderness; mucous membrane dark red, dry, or covered with copious secretion; swelling of membrane of cheeks and tongue; coated tongue; perverted taste; elongated palate.***

CHRONIC: ***Membrane swollen, showing small nodules; thick yellow mucus on gums and teeth; velvety coat on tongue; foul and slimy taste in mouth.***

This is a disease, which, although of very frequent occurrence, has been only recently recognized as of a catarrhal character. Catarrh of the mouth is very similar to the same disease elsewhere, and the mouth is even more liable to the disease than other parts. It is often associated with catarrh in other organs, as pharyngeal and nasal catarrh, and catarrh of the stomach. It is also a very common accompaniment of various fevers. It is not dangerous to life, though in small children it may give rise to convulsions which may prove fatal when arising from this as well as when produced by other causes of reflex irritation. It should not be supposed that all persons having a coated tongue and a bad taste in the mouth have oral catarrh. Either fevers or deranged digestion produces these symptoms. There must be also increased secretion of turbid or yellowish mucus, tenderness and swelling of the membrane, giving to the tongue a flabby appearance in consequence of which condition the impressions of the teeth will be seen in the edges. The difference between chronic oral catarrh and a similar condition produced by dyspepsia is that in oral catarrh proper the digestion is not at all disturbed. The two diseases may exist together, however. The elongation of the uvula gives rise to constant hawking, coughing, and spitting, by tickling the root of the tongue.

Causes.—The chief causes of catarrh of the mouth are cutting the teeth, gum-boils, rough or ulcerated teeth, wounds of the mouth or

gums, very hot, cold, or irritating foods or drinks, smoking and chewing tobacco, mercurial poisoning, catarrh of some other organ, as gastric catarrh, typhoid and typhus fever, and scarlatina. Sitting up late at night and mental excitement are also given as causes by eminent German observers.

Treatment.—Remove causes of irritation. In cases caused by difficult teething, more harm than good is done by lancing. Use soothing lotions when there is much irritation, as slippery-elm and flaxseed tea, and rinse the mouth often with cool water. Avoid all hot drinks. The disease will usually speedily disappear when the cause is removed. When obstinate in the chronic form, rinse the mouth morning and night with solution of carbonate of soda, a dram to the pint of soft water, or simple cool water. Cleanse the teeth and mouth thoroughly after each meal and before going to bed. If there is foul breath, use a weak solution of chlorinated soda as a gargle morning and night. For clamminess, chew a little piece of rhubarb just before retiring. It should be chewed some time, as its effects are wholly local.

APHTHÆ.

SYMPTOMS.—Catarrh of the mouth ; small white spots with red border on mucous membrane ; great increase of saliva ; fetid breath.

This affection is often called ulcerated sore mouth and thrush, but differs from both. When it occurs in a severe form, as it often does in young children, it is usually preceded by a slight fever and restlessness for several days, loss of appetite, and symptoms of catarrh of the mouth. When the other symptoms mentioned appear, there is considerable pain, and the patient, if an infant, finds difficulty in nursing in consequence.

Causes.—The disease is most frequent in infants, the chief causes being cutting of teeth and disturbances of digestion. Aphthæ also occurs in measles and canker sore mouth. Adults often suffer with the disease in a mild form in consequence of disturbances of digestion.

Treatment.—The mouth should be washed three or four times a day with a saturated solution of chlorate of potash. In addition to removal of the exciting causes, this is the only remedy required in most cases. If not successful, touch the white spots with a strong solution of nitrate of silver by means of a camel's-hair brush.

CANCRUM ORIS, DIPHTHERITIC INFLAMMATION OF THE MOUTH, OR CANKER OF THE MOUTH.

SYMPTOMS.—Gums red, swollen, bleed easily; whitish spots on mucous membrane, which cannot be wiped off, appearing first on gums; unhealthy ulcers; teeth loosened; lymphatic glands swollen and painful; lips and cheeks swollen; copious saliva, often bloody; pain in drinking or swallowing; foul breath; slight fever.

The above symptoms are usually accompanied with those of catarrh of the mouth and aphthæ. The unhealthy ulcers referred to are produced by the sloughing away of the discolored membrane. Notwithstanding the serious character of the disease, recovery usually occurs, even though the disease may continue for weeks or even months.

Causes.—The most common causes of the disease in infants, in whom it most frequently occurs, are unhygienic conditions, bad food, bad air, etc. In them it is often accompanied by serious disturbance of digestion, which may justly be regarded in the light of a cause of the disease. It is common in foundling-hospitals. The most common cause in adults is the use of mercury, which produces the most painful and obstinate form of the disease.

Treatment.—Give first attention to the causes of the malady. Secure good hygiene, and regulate the diet so as to improve the digestion. Use chlorate of potash lotion three or four times a day, and rinse the mouth with cold water very frequently. Under this treatment the ulcers will soon begin to heal, and in a few days the patient will be greatly improved. It is important that infants suffering with this disease should be taken much into the fresh air and exposed to the sunlight daily. A cool sponge bath to be followed by rubbing with olive oil or fine vaseline, should be administered daily. Peroxide of hydrogen in solution, one part to six of water, is a useful local remedy in case the chlorate of potash solution is not effective.

ULCERS OF THE MOUTH.

In addition to the severe forms of aphthæ and ulceration previously described, small ulcers frequently appear on the tongue and mucous membrane of the cheeks. The point of the tongue is a favorite seat for small, painful vesicles which burst and become small ulcers. Follicular ulcers often occur on the mucous membrane of the lips, being occasioned by the stopping up of the ducts of glands situated in this region. The most frequent cause is disturbance of digestion or irritation of rough teeth.

Treatment.—Apply chlorate of potash lotion, and wash the mouth with cool water several times a day, refraining from all hot foods and drinks. If necessary, touch the ulcers with nitrate of silver solution, ten grains to the ounce of water.

THRUSH, OR MUGUET.

***SYMPTOMS.**—Whitish points or a frosty coating; cheesy matter on tongue, roof of mouth, and inside of lips; pain on swallowing; burning pain; disturbance of digestion, often diarrhœa.*

This disease occurs in infants but a few days or weeks old, in very aged persons, and in persons much exhausted by disease, as just before death in consumption and fevers. In infants the local disease is usually accompanied by acidity of the stomach, which is probably both a cause and an effect of the local disease.

Causes.—The immediate cause of this disease is a vegetable parasitic growth known as the thrush fungus, the production of which is encouraged by lack of proper cleanliness of the mouth. If the mouth of infants is kept thoroughly clean, the disease will never occur. The mouth should always be washed out with a clean wet cloth immediately after feeding; as the remains of food left in the mouth form the best possible soil for the production of the disease. The practice of giving children sugar-teats, or little bags filled with a mixture of bread, milk, and sugar, is a most pernicious one. A more potent means of producing the disease under consideration could not be invented. An acid state of the stomach and a feeble condition of the system favor the production of the disease, probably on account of the greater liability to the accumulation of foul products in the mouth in these conditions. As the disease is probably contagious, care should be taken to isolate patients suffering from it.

Treatment.—Thorough cleansing of the mouth is of first importance. Fungi do not thrive except in the presence of filth. Wash the mouth *thoroughly*, before and after feeding, first with cool water, then with a cool solution of borax or sulphite of soda in the proportion of a dram to the ounce of water. Sugar, honey, and similar preparations should not be employed, as they encourage rather than cure the disease. After feeding and washing as directed, it is well to apply a mixture of powdered borax and glycerine in the proportion of a teaspoonful of the powdered borax to two tablespoonfuls of glycerine. Attention should of course be paid to the stomach and bowels, reme-

dies being applied in accordance with directions given elsewhere for derangements of these organs.

INFLAMMATION OF THE TONGUE; GLOSSITIS.

SYMPTOMS.—Tongue greatly swollen, often to double its usual size, upper surface white or brownish, smooth or cracked, covered with tough mucus, under surface red, ulcers on sides of tongue; severe pain which is increased by motion, making speaking, chewing, and swallowing difficult or impossible; drooling of saliva; glands of neck enlarged; in severe cases obstruction to circulation in head, and interference with respiration; high fever and full pulse.

This is a very rare disease, seldom occurring except as the result of direct injury to the tongue, as from a burn, a caustic application, or the sting or bite of an insect. With the application of proper remedies recovery usually takes place, though in severe cases death may occur from suffocation.

Treatment.—Apply general treatment to subdue the fever, and frequent sitz baths for derivative effect. Apply ice locally, allowing the patient to hold pieces of ice in his mouth. Keep the tongue moistened with soothing lotions, as slippery-elm and flaxseed tea. If ulcers form, use chlorate of potash lotion.

In chronic inflammation of the tongue when deep cracks or fissures are formed, the use of lotions of chlorate of potash and carbolic acid, and the application of a strong solution of nitrate of silver, ten or fifteen grains to two tablespoonfuls of water, constitute the best remedies.

GANGRENOUS SORE MOUTH, OR NOMA.

This is, fortunately, a very rare disease, as it is almost always fatal. It chiefly occurs in children whose constitutions are enfeebled by bad or insufficient food, bad air, filth, or other unhygienic conditions, and, according to Niemeyer, is often caused by the use of mercury. The disease is characterized by a low form of inflammation, giving rise to extensive sloughing, or gangrene, which begins on the inside of the cheek, extends to the gums, the lips, and the tongue; exposes the bones of the jaw, causing the teeth to drop out and the separation of portions of bone. Finally the disease may extend to the face, the whole cheek and even the nose becoming black and sloughy. When recovery takes place it is very slow, the lost parts being built up by granulation. The only remedies which do any good are those which, like the actual cautery, destroy the diseased tissues and thus excite a healthy action. Cases of this sort, of course, require the attention of a skilled surgeon.

SALIVATION.

SYMPTOMS.—Abnormal production of saliva; indigestion; emaciation.

This morbid condition is rather a symptom of disease than itself a disease. The amount of saliva daily produced in health is ten to twelve ounces. When the amount becomes so great as to be troublesome, escaping from the mouth, or requiring a person to spit or swallow to get rid of it, it may be said to be abnormal. Sometimes two to five quarts are produced in cases of disease.

Causes.—The causes of salivation are numerous. Anything which causes irritation of the mouth or mucous membrane of the stomach will produce it. It frequently occurs in fevers, and is produced by the cutting of the milk teeth, by decayed teeth, and especially by certain drugs, among which are all the preparations of gold, iodine, copper, lead, and particularly mercury, together with jalap, digitalis, jaborandi, and copaiba. Certain vegetable foods also, particularly tomatoes, sometimes occasion a slight irritation of the mucous membrane of the mouth which produces a profuse flow of saliva, and which has by some been erroneously taken as an evidence that tomatoes contain calomel, and hence should not be eaten as food. The worst form of salivation is that produced by the use of mercury. In some persons a very small quantity of this metallic poison will produce salivation; in others, a larger quantity is required. Mercury is always found in the saliva in cases of mercurial salivation, and its presence may be detected a long time after the drug has been administered. We have met persons who asserted that they had had recurrences of mercurial salivation at intervals for years after having had a "mercurial course." The eminent Dr. Wright, who devoted much time to the study of this subject, found that saliva containing mercury is inert, being so poisoned by the drug that its power to change starch into sugar is lost. This corresponds with the effect of mercury upon the bile, to which we have elsewhere called attention, and accounts for the indigestion and emaciation of patients salivated by mercury.

Treatment.—So far as mercurial salivation is concerned, the proper remedy is prevention by non-use of the drug. We believe that there is no disease or morbid condition which cannot be treated better without than with it. Dr. Vogel well demands that its use as a laxative "should be entirely done away with." As elsewhere shown, it is

worthless as a cholagogue, even if its operation as such would be in any way desirable. The only possible benefit we have ever seen derived from mercury has been in its use in very small doses as an intestinal antiseptic, but we are now acquainted with many drugs which are fully as useful as calomel for this purpose, and are free from the injurious effects of the various preparations of mercury.

In other forms of salivation, the cause should be removed as the first measure of treatment; and when this is done, little else remains to be done; recovery will soon take place. Good results may sometimes be obtained by the use of astringent gargles, as sage tea, decoction of white-oak bark, carbolic acid, or common salt. The electro-thermal and electro-vapor baths should be employed in cases of mercurial salivation, and much benefit will be derived from their use, as they are the best known means of eliminating the poison from the system. The diet should, of course, be simple and unstimulating, and every means possible should be adopted for building up the patient's general health.

PHARYNGITIS—CLERGYMAN'S SORE THROAT.

SYMPTOMS.—ACUTE: *"Cold in the throat;" "sore throat;" mucous membrane dry, red, and swollen, or covered with a tenacious secretion; pain in swallowing; nasal tone of voice; tickling in the throat, exciting cough; coated tongue; foul breath; salivation.*

CHRONIC:—*Slight pain in swallowing; granular appearance of the throat; elongation of the palate; tough, tenacious mucus, occasioning hawking and spitting; "hacking" or "hemming" cough; husky voice; expectoration of small, cheesy or calcareous masses; slight hemorrhages from the throat in the morning.*

Acute and chronic catarrh of the pharynx are among the most common of all forms of catarrhal disease. In some localities, one form or another of this disease seems to be almost universal. The causes are not always easy to determine, but the most common origin of the affection is a cold. Sometimes the disease assumes the form of an epidemic, the people of a whole neighborhood or a much larger section of country being almost universally affected at some time with the symptoms characteristic of acute catarrh of the pharynx. This is especially true of the form of the disease known as follicular pharyngitis, in which the throat presents a granular appearance. There are good reasons for believing that in these cases the disease may be allied to, if

not identical with, the affection known as diphtheria. We have observed cases in which the most severe form of diphtheria was evidently communicated by a person suffering with what was apparently simple follicular pharyngitis. This malady is unquestionably a germ disease. It is doubtless more or less contagious in character. Recent investigations show that the germ which produces this disease very closely resembles the germ of diphtheria. The disease, in both its acute and chronic form, has some tendency to extend into the larynx and thence into the bronchial tubes, inducing acute or chronic bronchitis, although this tendency is not so strong as is generally supposed.

The chronic form of the disease is most commonly the result of repeated attacks of acute pharyngeal catarrh, though it not infrequently arises insidiously, giving no history of acute symptoms. The persons most subject to the habit are those addicted to the use of liquor, tobacco-users, persons of sedentary or dissipated habits, those exposed to an atmosphere charged with dust or irritating gases. A humid atmosphere and changeable climate favor the production of this disease. Males are more frequently affected than females. It is found in its worst form in persons of vicious habits. What is known as clergyman's sore throat is a form of this disease, and it is undoubtedly the result of the sedentary habits of this class of persons. Diseases of the stomach and liver are frequently causes of pharyngeal catarrh. Bad dietetic habits are an important factor in the production of this disease. The use of mustard, pepper, vinegar, pepper-sauce, ginger, and various other condiments, and the excessive use of salt, sugar, fats, and animal food, must be set down among the principal predisposing causes of this form of the disease. In this way the terms "stomach cough" and "liver cough" have arisen, the stomach being really the remote cause of the cough, the direct source of which is the irritation in the throat. The most annoying symptom of chronic pharyngitis is the hacking or "hemming" cough, which is sometimes very harassing. The cough arises in some cases from the irritation from the tenacious mucus of the soft palate, and in others from the elongation of the palate. When the palate becomes so long that the end rests on the back part of the tongue, it is very likely to cause a most annoying cough, and efforts at expectoration.

Chronic pharyngitis is often found connected with partial or complete deafness accompanied with the usual symptoms of chronic catarrh of the ear which has been induced by an extension of the disease from

the throat through the Eustachian tubes to the middle ear. This is, indeed, the most common origin of deafness, and the connection between these two conditions has given rise to the term "ear cough." Another common accompaniment of chronic pharyngeal catarrh is enlargement of the tonsils. This affection will be described under the head of "Tonsillitis." The small, cheesy particles frequently expectorated in this disease are masses of hardened secretion coming from the enlarged follicles of the throat, which may be easily seen as whitish bodies, varying in size from that of a millet seed to the size of a pea, imbedded in the tonsils. They gradually ulcerate out, and are discharged. The fetid odor is due to the decomposition which has taken place. Occasionally calcareous decomposition takes place, when the fetid masses are found to be hardened in character, and chalky. These particles are usually mistaken for tubercles, being supposed to come from the lungs, and are taken as a sure sign of tuberculous disease, or consumption. We have often found it very difficult to convince patients to the contrary. Every one should be convinced of the truth by the fact that tubercles are microscopic in size instead of being as large as these particles are found to be.

Treatment.—The acute form of the disease usually disappears in a very short time, seldom lasting but a few days, and generally disappearing almost wholly within two or three weeks. This fact leads most people to pay very little attention to the difficulty, which is thought to be only a "cold" that will speedily cure itself. We wish, however, to direct particular attention to the fact that this popular notion is a very mischievous error, since it is not infrequently the occasion of encouraging neglect, and results in the production of chronic and sometimes incurable disease. A cold is by no means so transient in its effects as is generally supposed. While an attack of acute catarrh of the pharynx frequently disappears in a short time, the effects produced by it remain more or less permanent, the patient being much more liable to suffer in the same way again than if he had not contracted the disease. As before remarked, it is by repeated attacks of acute catarrh that the foundation is laid for obstinate chronic pharyngitis. Hence the importance of giving prompt attention to the treatment of even the simplest form of cold in the throat. Of the large number of remedies proposed for the treatment of this disease, regular, irregular, and domestic, none give so prompt and complete relief as hot fomentations applied to the throat externally, and internal

applications of warmth and moisture by means of steam inhalations. An inhaler can be improvised by connecting a rubber tube with the spout of a tea-kettle or coffee-pot, or the simple form of inhaler shown on page 802 may be used. The inhaler referred to is so convenient and effective in use, and so inexpensive that it ought to be found in every family, ready for use when required. When there is much dryness and irritation in the throat the use of soothing gargles, as slippery-elm water, linseed tea, or thin mucilage water, will be found useful. Chlorate of potash gargle is also serviceable. When there is slight fever, as is generally the case, the patient may take a wet-sheet pack or a Russian, Turkish, or vapor bath, whichever is most accessible. The throat should be kept warm and moist, and the skin active. Care, should be taken to avoid exposure to drafts and cold air, by which means the perspiration may be suddenly checked. By the judicious use of these simple measures, nearly every case can be cured in a few days, and unpleasant after-effects avoided.

The treatment of chronic catarrh of the pharynx is a much more serious matter. There are few affections which are more obstinate and unyielding to treatment than this. The avoidance of all causes of the disease is of the greatest importance. The patient should adopt a plain, simple dietary, avoiding condiments, the use of fats, sugar, pastry, and all stimulating and clogging foods. If the patient has been addicted to the use of alcoholic liquors or tobacco in any form, these habits must be at once abandoned. Every possible measure should be taken to build up the general health by frequent bathing, keeping the skin in an active condition, as well as by out-of-door exercise and careful regulation of all the habits. In addition to careful attention to the general health, local cold applications to the throat are of the first importance. Gargles, lozenges, and various other remedies, immense quantities of which have been used for this affection, are really of little consequence, as they do not reach the real seat of the disease.

Local remedies, to be of any value, must either be applied directly to the throat with a swab or brush or inhaled in the form of vapor or atomized spray. In the treatment of several hundred cases of chronic pharyngitis in which we have experimented in the use of a large number of remedies, we have found nothing of so much real value as the inhalation of hot vapor by means of the steam inhaler already mentioned. The various other remedies may be employed in connec-

tion with the warm vapor, but these are of trivial importance when compared with the vapor itself. After using nearly all the various substances which can be thus employed, we have become thoroughly convinced that steam alone is, for the majority of cases, as useful as any medicated vapor. It is important that inhalation should be taken as hot as it can be borne, and the inhaling tube should be introduced into the mouth sufficiently far to bring the hot steam in contact with the affected membrane. The effect is similar to that of the hot douche. Additional benefit may be derived in some cases by the use of gum benzoin, a fragment of which may be dropped into the inner cup of the inhaler when its use is desired. See Figs. 273, 274.

Hot solutions of chlorate of potash, tannin, and various other substances used with the atomizer, will also be found useful in the treatment of this disease. For local applications with the swab or brush, nothing is better than a saturated solution of chlorate of potash. We have sometimes used with benefit a mixture of tannin and glycerine, four parts of the former to one of the latter. We have also found useful a mixture consisting of twenty grains of hydrate of chloral and ten drops of tincture of iodine with an ounce of glycerine. Apply daily to the pharynx with a camel's-hair brush.

In addition to the measures of treatment mentioned, much benefit may be derived from the use of the hot-water gargle if pains is taken to allow the water to pass down deeply into the throat by throwing the head well back. The water should be as hot as it can be well borne. The effect of this is similar to that of the hot spray. The gargle should be used four or five times a day for four or five minutes at a time. The relief it will sometimes give is surprising.

The cold wet compress worn about the throat at night, followed by brisk rubbing with cold water in the morning, is another useful measure. This has a double effect, first, to allay local congestion; second, to harden the throat so as to diminish the liability to colds. The practice of wearing thick furs and woolen comforters about the neck is unnecessary, except in the coldest weather, and when habitual, is one of the most frequent causes of taking cold, as the throat is made unnaturally susceptible to change of temperature, and its resistance to cold is destroyed.

In conclusion, we would impress upon the reader the importance of persevering in the treatment of this affection. Notwithstanding its obstinate character, patient continuance in the use of proper measures

will, with rare exceptions, effect a cure or great improvement; and as the disease is so frequently the occasion of obstinate, if not incurable, deafness, it is really of a very serious character, even if the local symptoms are not so very annoying. (See Appendix, page 1595.)

QUINSY—TONSILLITIS.

SYMPTOMS.—Chilliness; marked fever; redness and swelling of the tonsils and soft palate; pain and some difficulty in swallowing; entrance of liquids into the nasal cavity on attempting to swallow; pain behind the angle of the lower jaw and in front of the ear in advanced stage of suppuration.

Tonsillitis, or inflammation of the tonsils, is usually accompanied by acute inflammation of the pharynx, or soft palate, and hence necessarily presents nearly all the symptoms mentioned as characteristic of the latter affection. On account of the more extensive swelling of the tonsils, there is much greater pain than accompanies pharyngeal catarrh, and the ear is much more liable to be affected by the extension of the disease through the Eustachian tubes. There is usually headache and a very full pulse. The chilliness and febrile action frequently precede the swelling of the tonsils several hours or even a day. The tongue is heavily coated, the patient has very little appetite, and if disposed to eat would be nearly unable on account of the pain in swallowing. Unless speedily arrested in its early stages, the disease goes on to suppuration, and, if the discharge is not hastened by lancing, usually breaks and discharges in the mouth while the patient is asleep or during a fit of coughing. The pus of the discharge is usually swallowed when the discharge occurs during sleep, and the patient awakes from his troubled sleep very greatly relieved. The causes of the disease are the same as those which provoke acute pharyngitis.

Treatment.—The treatment is practically the same as that described for acute catarrh of the pharynx, but should be much more energetic. During the first stage of the disease, benefit may be derived from holding pieces of ice in the throat and packing the throat with pounded ice wrapped in a towel. At intervals of from two to three hours, alternate hot and cold applications should be made to the throat. The burning and dryness characteristic of the first stage of the disease may be relieved by mucilaginous gargles and drinks. Packs, tepid sponging, and the use of large compresses about the trunk, are measures which may be advantageously employed to subdue general fever. If suppura-

tion threatens in spite of efforts to abort it, it should be encouraged by the use of inhalations of steam and hot fomentations applied to the throat instead of the ice-pack. When the case is taken in time, the measures described will be found the most universally successful in aborting the disease. When suppuration has evidently taken place, and the swelling in the throat has become soft, showing the presence of matter, much time may be saved by lancing the tonsil to evacuate the pus. In most cases, rapid recovery will take place, the tonsil returning to its natural size. Now and then a tonsil remains permanently enlarged. One attack of this disease predisposes to another, so that persons sometimes become so susceptible as to suffer an attack of tonsillitis from the slightest exposure. If recovery is not speedy, call a physician.

ENLARGED TONSILS.

SYMPTOMS.—Sensation of a lump in the throat upon one or both sides; difficulty in swallowing in extreme cases; voice changed, patient often being unable to pronounce certain words; great susceptibility to "cold in the throat;" constant irritation in throat; in many cases, impairment of hearing.

As previously remarked, this disease is often the result of acute inflammation of the tonsils. The enlargement is sometimes confined to one side, but frequently both tonsils are affected. In some cases the enlargement is so great that the passage through the throat is almost entirely obstructed. We have frequently had cases in which the two tonsils came in contact, so great was the enlargement. Sometimes enlargement is produced gradually. This is especially the case in scrofulous children. The results of enlarged tonsils are more serious than are generally supposed. They not only occasion permanent injury to the voice, giving it a nasal character on account of the partial paralysis of the soft palate, preventing complete closure of the passage to the nasal cavity, but not infrequently occasion serious injury to the middle ear from inflammation of the Eustachian tubes.

Treatment.—In cases of slight enlargement, the treatment described for chronic pharyngitis may be given with success. Where the enlargement is very great, there is no remedy but removal. The operation is not a serious one, and should be resorted to promptly when its necessity becomes apparent.

In cases in which the removal of the tonsil by surgical means is objected to, the morbid growths may be destroyed by means of the galvano-cautery or by applications of chromic acid made with a silver probe. Enlarged tonsils are a menace to health, often harboring in their crypts the germs of tuberculosis, pneumonia, and diphtheria.

DISEASES OF THE ŒSOPHAGUS.

Inflammation and Ulceration of the Œsophagus.—The œsophagus is subject to all the forms of inflammation which affect the mouth and larynx, though less liable to be thus affected. Inflammation of the œsophagus is most often excited by swallowing hot food and caustic or irritating substances, or by injury from a fish-bone or some angular body accidentally swallowed. Ulcers of the œsophagus may be produced by injuries from foreign bodies introduced by accident, or by the injudicious use of the stomach-tube. When inflammation or ulceration of the œsophagus exists in the lower part of this organ, it may be overlooked, as the sensibility of this part is not very great. Pain is usually felt between the shoulders.

The treatment of inflammation of the œsophagus is as nearly as possible the same as that suggested for inflammation of the mouth, the application of cold and the swallowing of small bits of ice being the most effective of such measures. Little can be done for ulceration of the œsophagus except to improve the patient's general health in every way possible, and cause him to abstain from the use of other than bland and unirritating articles of food.

Stricture of the Œsophagus may result from inflammation, or from the contraction of its walls after the healing of an ulcer. It may also be produced by aneurism, or by an abscess forming at one side. It usually develops gradually, the patient finding difficulty in swallowing steadily increasing until, at last, he cannot even swallow liquids. The obstacle always seems to the patient to be just beneath the upper part of the sternum, although its real position may be opposite the lower end or some intermediate part. When the obstruction becomes complete, several mouthfuls will often be retained, but only to be thrown up again. In most cases the patient gradually starves to death. The rational treatment is mechanical dilatation by probes, first smaller, and then larger, as the dilatation increases. Some cases will not yield, and in these the result is, of course, starvation. In cases which do not yield to this method of treatment, the patient's life may be prolonged by a surgical operation, by means of which an opening is established into the stomach, through which food is passed from the mouth, after having been masticated, by means of a rubber tube.

Dilatation of the Œsophagus is an opposite, though very rare affection, which is also the cause of death in some instances. The dilatation may be complete through the whole length, cases having been observed in which it had increased to the size of a man's arm; or it may be confined to a small portion. Sometimes it exists in the form of a large sac connected with the œsophagus by a small opening through which the food passes, being retained in the sac instead of passing down to the stomach. In cases of the latter sort the food is retained in the cavities described until it undergoes decomposition, when it is expelled during attempts at swallowing. The treatment of this disease is very unsatisfactory, no remedy being in any great degree successful. In bad cases the only way of supporting the life of the patient is by passing food into the stomach by a tube, or by rectal alimentation.

Morbid Growths occasionally occur, giving rise to both stricture and dilatation. These are sometimes of a fibrous character, but not infrequently cancerous. Cancer of the œsophagus occurs most frequently in elderly persons who have been addicted to the use of alcoholic liquors. It is, of course, a fatal disease. The treatment can only be palliative, and the patient must be nourished by means of nutritive enemata. Sometimes, in cancer of the œsophagus as well as ulceration, a perforation occurs, which is not infrequently accompanied by instant death.

Nervous Diseases of the Œsophagus are perhaps the most common affections to which this organ is subject. The affection most frequently met with is that known as *globus hystericus*, so-called on account of the peculiar sensation, which is that of a ball rising into the throat, sometimes causing choking, and rendering the patient unable to swallow. As the name indicates, this affection is met with in hysterical persons, and consists simply of a spasmodic contraction of the circular muscular fibres of the œsophagus. The contraction may exist for several days, or may last only a few moments. It usually comes on during eating. In some cases there seems to be a reversion of the action of the œsophagus, so that, as the patient says, when he attempts to swallow, "the muscles work the wrong way." Remedies calculated to relieve congestion of the nerve centers are usually sufficient to dissipate this unpleasant symptom. We have found the application of ice to the back of the neck and between the shoulders, and the patient use of galvanism, to be successful. When the contraction continues to exist in spite of other measures, it may in most cases be relieved by passing a flexible tube down the œsophagus.

Paralysis of the Œsophagus is an affection which usually exists in connection with general paralysis, being very rarely a primary affection. When incomplete, the patient can swallow with difficulty, liquid food being taken better than solid. In cases of complete paralysis, swallowing becomes impossible. The use of electricity is the only remedy which promises a favorable result. As in most other affections of the œsophagus which interfere with nutrition, life may be maintained by the use of nutritive enemata, or the patient may be nourished by means of a feeding-tube passed into the stomach.

DISEASES OF THE STOMACH.

ACUTE INFLAMMATION OF THE STOMACH—GASTRITIS.

***SYMPTOMS.**—Pain and heat at the pit of the stomach, pain increased by pressure; great nausea, with violent retching and vomiting; great thirst; desire for cold drinks, which are vomited as soon as swallowed; high fever and rapid pulse; quick breathing; bowels constipated; urine scanty and high-colored; tongue white and heavily coated; great prostration.*

Causes.—This disease rarely occurs except when produced by poisons taken into the stomach as by swallowing mineral poisons,—alkalies, antimony, arsenic, etc. Cases have occurred in which gastritis was produced by taking boiling liquids into the stomach. Probably the most common cause is the use of alcoholic stimulants taken on an empty stomach. We have also seen it produced by eating animal food or excessive quantities of food when convalescing from a fever. It is a frequent accompaniment of *delirium tremens.* The disease is a very serious one indeed, and not infrequently ends fatally.

Treatment.—The first and most important measure of treatment is, as nearly as possible, absolute rest for the stomach. For drink, give the patient small bits of ice to hold in the mouth. If thirst is very great, let him take small quantities of cold mucilaginous drinks, as iced slippery-elm water. The thirst can in most cases be relieved by large injections of tepid water, which should be retained as long as possible. A sponge or towel should be held against the lower end of the bowels to prevent the water from passing away before being absorbed. It is of no use to trouble the stomach with food, as it will be almost certain to be vomited soon after it is swallowed, and if it is retained, will not be digested, as the secretion of the gastric juice is suspended while the stomach is in a state of inflammation. For nutritive enemata, employ beaten eggs, two to the pint of water, with one-half dram of salt.

This may be injected in quantities of from six to eight ounces eight times a day. At least two pints of the solution should be taken in twenty-four hours. Beef tea should not be used, neither the extracts sold in stores, as these animal extracts contain very little nourishment, being chiefly stimulating in character.

Nutritive enemata should always be about blood temperature when used. Ice-cold compresses should be applied to the stomach constantly, being renewed as frequently as is necessary to maintain their effect. When the acuteness of the inflammation has been subdued, warm poultices or fomentations may be applied to the stomach with advantage. When the fever is high, cool sponging and the use of large injections into the bowels should be resorted to. Emetics, laxatives, cathartics, and everything irritating should be sedulously avoided. There should not be too much haste about troubling the stomach with food. We have sustained patients suffering with acute gastritis for several weeks by means of nutritive enemata without difficulty. The first articles taken should be very bland in character and unstimulating, such as well-boiled and strained oatmeal gruel, well-boiled rice, milk, or milk and lime-water in the proportion of one part of lime-water to five of milk. Meat and flesh-foods of all kinds should be carefully avoided.

The best means of controlling the vomiting is the withholding of all substances, either solid or liquid, from the stomach until the vomiting ceases. In case the inflammation is the result of undigested food, treatment should be begun by washing out the stomach by means of a stomach-tube. If necessary, this washing may be repeated daily for several days. After each washing, the patient should be made to swallow a dram of subcarbonate of bismuth suspended in a little water.

ACUTE CATARRH OF THE STOMACH—BILIOUS ATTACK.

***SYMPTOMS.**—Indigestion; heaviness at the pit of the stomach; dizziness; furred tongue and bad taste in the mouth; "sick headache;" tormenting pain in the forehead and temples, extending toward back of head; flashes before the eyes on stooping; feeling that the head will burst; vomiting of foul and acrid matters, and finally of yellow or greenish bile; in some cases, griping of the bowels and diarrhea.*

A fact not generally known but well established is that catarrh of the stomach is the commonest of all forms of stomach disease. The digestion of each meal requires an unusual accumulation of blood in the mucous membrane of the stomach and an increased production of

mucus. All that is required for the production of gastric catarrh is a slight exaggeration of this physiological process. The disease is common to all ages of life, and is particularly frequent in children. Fortunately, it is not very serious in its results, as it quickly subsides, and disappears in a few days. The symptoms given above are those characteristic of the disease in its most marked forms. Very frequently the symptoms are so slight in character as to be scarcely observable otherwise than by loss of appetite, coated tongue, feeling of lassitude, and perhaps heaviness of the stomach.

In what is generally known as a "bilious attack," in which the liver is commonly supposed to be affected, the real difficulty is with the stomach, the affection really being gastric catarrh. The pain felt under the border of the ribs on the right side, and attributed to the liver, is due to an extension of the disease from the stomach to the duodenum.

Sometimes, also, the catarrhal inflammation extends into the bile duct, thus completely obstructing the flow of bile, and occasioning its absorption into the system, which gives rise to the yellowish appearance of the skin and dingy yellow color of the whites of the eyes seen in jaundice. Bilious attacks nearly always follow some indiscretion in eating. For instance, if a person subject to the disease eats a late supper, he will be quite sure to awake in the morning with what is termed a "splitting" headache, bad taste in the mouth, coated tongue, and no appetite. Soon after he gets up, if he attempts to rise, he begins to feel sick at his stomach and soon vomits acid and very foul-tasting matters,—decomposed remains of his last meal, and perhaps of one or two preceding meals. As the vomiting continues, he begins to throw up bitter, yellowish matter, which is almost directly after followed by an intensely bitter, greenish fluid, easily recognized as bile. The yellow matter is also bile discolored by the gastric juice. It only becomes green after the gastric juice has been neutralized. The vomiting is believed by patients to be caused by "bile on the stomach," and it is thought necessary to employ an emetic, or a laxative to carry it away by means of the bowels. Both of these measures are unnecessary and in the highest degree mischievous. The bile was not in the stomach when the vomiting commenced, but was brought into it by the violent retching, which reverses the action of the small intestine for a short distance below the stomach so that the bile is carried upward instead of downward.

Causes.—The principal exciting causes of the disease are the following:—

1. Overeating. More food being taken than can be digested, it undergoes decomposition, and the irritating products of fermentation excite congestion, which finally produces catarrh. The catarrhal symptoms do not usually occur until some hours after the overloading of the stomach, usually not until next day, as some time is required for the diseased condition to become established. Children frequently suffer from this cause, being allowed to nurse too long or to take too large a quantity of milk at a time. Generally, the infantile stomach repels a portion of the food when a larger quantity is taken than can be digested, retaining only the proper quantity; but in some cases vomiting does not occur easily, and then an excessive quantity may be retained, which, undergoing decomposition, occasions gastric catarrh. It is this fact which has given rise to the popular notion that it is a good sign for children to vomit often and easily, it being observed that such children sicken less readily than others.

2. Another common cause of gastric catarrh is the use of indigestible articles of food in even moderate quantities. As articles of this class may be mentioned all kinds of fat foods, fried foods, pastry, sweet-meats, preserves, ices, hard-boiled eggs, hash, and many other articles well known to be difficult of digestion. Animal fats are especially productive of catarrh, not only on account of being difficult to digest, but owing to the fact that they are not affected by the gastric juice they interfere with the action of this digestive fluid upon other portions of the food.

3. Another active cause of gastric catarrh is the use of foods which have begun to undergo decomposition. Game, meat that has been kept for some time until it has reached the condition technically known by epicures as "high," stale vegetables, rancid butter, and milk which has begun to sour, are all very likely to occasion acute gastric catarrh. Feeding infants with milk which has begun to sour, even in a very slight degree, is a great cause of infant mortality in the summer. Not infrequently, fermentation of milk is set up by contact with a nursing-bottle which has been imperfectly cleansed. The tubes commonly used in connection with nursing-bottles are absolutely dangerous, as it is almost impossible to cleanse them so thoroughly as to prevent possible injury in this way. Children also suffer from the neglect of nurses to cleanse the mouth after food is taken. This should

invariably be done, as milk will decompose in the mouth, and the next time the child is fed, the germs of fermentation will be communicated to the fresh milk taken, and fermentation will occur in the stomach. Neglect to take the simple precautions necessary to prevent fermentation in the stomach is one of the most active causes of disease in children in the warm season of the year.

4. Still another cause of acute gastric catarrh is irritation of the stomach from the use of very hot or very cold foods or drinks. The use of tea, iced water, and ices in general, is especially objectionable for this reason. Drugs of various sorts, alcoholic drinks, and spices are especially productive of this disease. Spices and other condiments, when used in small quantities, at first excite digestion, but by increasing the process beyond its natural activity a reaction follows, which leads to gastric catarrh.

5. Stimulants and narcotics are particularly productive of gastric catarrh, first, by direct irritation of the stomach; second, by diminishing the secretion of gastric juice. Opiate and narcotic drugs also lessen the activity of the stomach, by which means food is too long retained in it, and irritation is thereby produced. The use of tobacco in any of its forms, also of tea and coffee, is a very common cause of gastric catarrh, or bilious attacks. We have seen people relieved of the disease entirely, after having suffered almost constantly for many years, by discontinuing these habits.

6. The most common of all the causes of gastric catarrh is dilatation of the stomach, which is always found in persons subject to bilious attacks.

Gastric catarrh is frequently produced in weakly children and adults who are just convalescing from some exhausting disease by causes which would not affect a healthy person injuriously. It is also frequently excited in children by using cow's milk without sufficient dilution, by the use of meat and vegetables for which the stomach is not prepared, especially by the use of confectionery and sweet-meats, with which they are often supplied as a means of keeping them quiet. Taking a hearty meal when the system is exhausted is a not infrequent cause of this disease. Sometimes the disease assumes an epidemic form, appearing in a large number of cases about the same time without any apparent cause. The exact causes in these cases are not yet well determined.

Treatment.—Give the stomach rest. The patient should take no food for twenty-four hours, or, at the most, nothing but a few sips of

water-gruel or something of a very light, starchy character. The warm full bath will greatly mitigate the patient's suffering by relieving the congestion of the head. Care should be taken to keep the feet thoroughly warm by means of hot jugs, bricks, etc. Very hot, or alternate hot and cold applications may be made to the head. Fomentations over the stomach and bowels should be applied for several hours at the beginning of the attack. It is generally not best to administer remedies to stop the vomiting, at any rate at first, as it is a remedial effort of nature to remove from the stomach the offending matters which would do great harm if allowed to remain. The violence of the retching may be greatly relieved, and the stomach more quickly and thoroughly emptied, by making the patient drink large quantities of warm water. The stomach should be washed out by means of a stomach-tube, thus cutting short the attack at once ; or by its use once or twice a week, in connection with proper diet, the attacks may be prevented.

When the character of the matters vomited clearly shows that the stomach has been emptied of the decomposing food which it contained, give a few sips of hot water or bits of ice. It is well also to administer large warm enemata for the purpose of relieving the bowels as quickly as possible. They are almost always found to be obstinately constipated in these cases. Persons subject to frequent attacks of gastric catarrh have what is known as bilious dyspepsia, and must carefully avoid all the causes enumerated if they would recover health. All kinds of articles of food difficult of digestion, especially fat meats, fried foods, and most animal foods, together with butter, sugar, hot drinks, spices, and condiments, must be discarded from the dietary. As the digestion is very slow, meals should be placed sufficiently far apart to give the stomach plenty of time for digestion. Two meals a day are for such a person far preferable to more. Nothing should be taken under any circumstances after five o'clock in the afternoon, and nothing after four o'clock if the patient is in the habit of retiring early. Most patients will derive great advantage from a diet composed almost wholly of fruits and grains, avoiding meats and coarse vegetables. About the only vegetables which are tolerated by persons subject to gastric catarrh are potatoes and asparagus. The wearing of the *umschlag*, or wet girdle, constantly during the night is an excellent curative measure which may be adopted with benefit by persons suffering from this distressing affliction. When catarrh of the

stomach is the result of taking cold, the most prompt and efficient measure is a sweating bath of some kind, as the warm blanket pack, the vapor or Turkish bath.

CHOLERA MORBUS.

***SYMPTOMS.**—Vomiting, soon followed by purging; watery, acrid or acid discharges from the bowels; colicky pains, cramp in the feet and limbs; hiccough; rapid and feeble pulse; cold skin, often bathed with clammy sweat; voice feeble and hollow.*

This is a germ disease which bears a rather close resemblance to Asiatic cholera, although by no means so grave a malady. It is sometimes attributed to excessive eating, but although the disease most frequently occurs in hot weather, it is generally excited by errors in diet, as the use of cheese, unripe fruit, etc. Sometimes the disease assumes an epidemic form, a large number of persons being attacked at about the same time. Attacks most frequently come on during the night, the first symptom being a feeling of pressure at the pit of the stomach, which is shortly followed by nausea and vomiting. The matter vomited first usually consists of undigested food. After a time, a pale yellow or greenish fluid, intensely acrid, bitter, or acid, is vomited. Griping pains in the bowels are also present. The discharges from the bowels are at first pulpy in character, but soon become liquid, enormous quantities of fluids passing from the body. The result of this great discharge of fluids is a rapid shrinking of the tissues, giving to the features and other parts of the body a pinched appearance. The nose is pointed, the eyes sunken, and the skin appears dry and shriveled. It is always cold, and sometimes covered with a clammy perspiration. The discharges from the bowels sometimes have the appearance of thin rice-water or thin gruel, which gives the disease a close resemblance to cholera. The depression of the patient is very great, the voice becoming hollow, and sometimes being lost altogether. Notwithstanding the serious aspect of the disease, it usually subsides in a few hours, the patient making a rapid recovery. Sometimes, however, the discharges become involuntary, the pulse disappears, and the patient finally dies of exhaustion.

Treatment.—At the beginning of the affection, drink freely of warm liquids to facilitate evacuation of the stomach. The stomach should be washed by means of the stomach-tube when possible. A large hot enema should be administered after each evacuation of

the bowels. The addition of tannin, one dram to a quart of water, is serviceable.

When the vomited matters no longer show traces of food, efforts should be made to stop the vomiting. Give the patient bits of ice the size of a bean to swallow every few minutes. At the same time apply hot fomentations over the stomach and bowels. If the patient suffers much from cramp, put him into a warm bath. Do not be alarmed if the vomiting and purging are not checked at once. If the case is an unusually severe one, or the patient is far advanced in years, or a young child, a physician should be called at once. It is especially important in this disease, to withhold milk and all its preparations. The first food taken should be farinaceous. Preparations of gluten and granola (manufactured by the Sanitarium Health Food Co., Battle Creek, Mich.) are especially to be recommended in these cases. Oatmeal gruel, well boiled and strained, is also useful. A similar disease occurring in winter is sometimes called *winter cholera.* The treatment is the same.

CHOLERA INFANTUM.

***SYMPTOMS.**—Vomiting and purging, sometimes almost incessant; spasmodic pain in stomach and bowels; great prostration; bowels bloated or sunken; other symptoms mentioned in connection with the preceding disease.*

Recent investigations have shown that cholera infantum is probably due to poison produced by a germ or germs known as tyrotoxicon or other similar poisons. This poison was first found in cheese by Professor Vaughn, of the University of Michigan.

Treatment.— The treatment should be essentially the same as that described for cholera morbus. The application of cold to the stomach is very beneficial. Where the child cannot swallow ice, iced water may be given in very small quantities every few minutes. A matter of very great importance in the treatment of cholera infantum is giving the stomach entire rest. No attempt should be made to feed the child for at least twenty-four hours. There will be no suffering for want of food if it is withheld as long as the stomach is in such a condition.

This poison is readily formed from milk, but not so readily developed from other substances; hence the necessity of withholding milk in these cases until nature has had time to rid the alimentary

canal of the poison-producing germs. White of egg dissolved in water is an excellent preparation in these cases, and will often be retained and digested when other food cannot be retained. Egg enemata (p. 741) may also be advantageously used. Malted gluten, lac vegetal (Modern Medicine Co., Battle Creek, Mich.), and the Battle Creek Sanitarium Health Food Co.'s Infant Food are of special value in cases of this sort. The tendency to depression is very great. This should be combated by warm baths, and the hot blanket pack when the surface is cold, or the hot enema, keeping the child wrapped warmly. Apply heat about the body when necessary by means of hot bottles or by means of rubber bags containing hot water. In convalescent cases, great care should be taken in returning to milk diet. The milk should be thoroughly sterilized by boiling for half an hour before administration to the child, and should be mixed with some barley water so as to avoid the formation of large cards in the stomach. Malted milk is to be recommended. If this cannot be obtained, it may be prepared as follows: Add a heaping tablespoonful of flour to a pint of milk. Boil for fifteen or twenty minutes. Remove from the fire and add a pint of cold milk, which has previously been sterilized by boiling and afterwards cooled. This will reduce the temperature of the mixture to about 130 or 140 degrees. Now add two ounces of the syrupy extract of malt, keep in a warm (not hot) place for an hour, and boil again. If necessary, thin slightly by addition of water. Cream, diluted with water, may also be used advantageously instead of milk.

CHRONIC GASTRIC CATARRH.

SYMPTOMS.—Pressure and fullness at the stomach after eating; flatulence; heart-burn; little or no appetite; vomiting; water-brash; tenderness at the pit of the stomach; slimy tongue; bad taste in the mouth; obstinate constipation; occasional jaundice; mental depression; lassitude; pains in the limbs and face; sleeplessness.

This disease is much more common than is generally supposed, and includes quite a large proportion of cases which are usually classed under the ambiguous head, dyspepsia. The most troublesome symptoms of this disease are due to deficient secretion of the gastric juice, dependent upon the congested state of the peptic glands, and the choking of the follicles with mucus. The great abundance of mucus also interferes with the action of the gastric juice by rendering it alkaline, and by coating over

the food, and rendering it impermeable by the digestive fluids. Deficient muscular activity of the stomach is also occasioned by the partial paralysis of the walls of the stomach consequent upon long-continued congestion. The disease is often long-continued, the patient rarely recovering without the employment of some special measures adapted for his relief. Its results, when long-continued, are thickening of the mucous membrane of the stomach, sometimes to an enormous extent, gastric ulcer, contraction of the pylorus, and enlarged stomach. Patients rarely die of the disease itself, life being cut short by other diseases which are produced by the great exhaustion and debility caused by the defective nutrition. Consumption very frequently follows neglected gastric catarrh.

Causes.—The causes are the same as have been mentioned as productive of acute gastric catarrh, by far the most important being errors in diet, the use of alcohol, drugs, tea, coffee, tobacco, and frequent exposure to heat and cold. The disease is very frequently the result of repeated attacks of acute gastric catarrh. The excessive use of sugar, honey, and the use of confectionery, is often the cause of chronic gastric catarrh, as are also condiments, hasty eating, coarse foods, over-eating, and chronic acidity from fermentation.

Treatment.—Of first importance in the treatment of this disease, as in nearly all other serious affections, is entire discontinuance of all the causes which may have produced it. This is absolutely necessary; and it is impossible to effect a cure unless the patient is willing to deny himself and observe a strict regimen until the stomach is restored to a normal condition. The diet must be restricted to such articles of food as will be easy of digestion, will not overtax the stomach, and do not easily undergo fermentation. Sugar, butter, and condiments of all sorts, must be avoided. Coarse vegetables, flesh foods, and all foods known to be difficult of digestion, must be excluded from the dietary. Kumyzoon is for many cases of gastric catarrh an admirable dietary. Granose, granola (see appendix), well-cooked, sweet fruits, such as prunes, raisins, figs, and whortleberries, are also to be recommended in these cases. Charcoal tablets are also useful. In cases in which there is no acidity of the stomach, or heart-burn, bland farinaceous articles are the best, such as well-boiled and strained oatmeal gruel, fruits not seedy in character, baked apples, and similar foods.

Flesh food, especially game and fish of all sorts, oysters and

other shell-fish, is to be avoided in these cases in consequence of the inertness of the stomach and the readiness with which these substances undergo decomposition when retained too long in the stomach. Zwieback, if well softened or well masticated, will be found useful. In cases in which there is great acidity, starchy articles of food must be mostly avoided. Proper regulation of the diet is the most important measure of all. Coarse foods must be avoided when there is much local irritation, the diet being restricted to well disintegrated foods. An aseptic diet, and in severe cases a liquid diet, excluding, however, milk, except in the form of kumyzoon, kumyss, or buttermilk; beef tea and meat broths of every description must be avoided for a considerable length of time. Condiments must be avoided as well as all exciting food substances, together with tea and coffee, and alcoholic liquors in every form.

Buttermilk is an article which agrees remarkably well with some cases of gastric catarrh. In the worst cases, however, no article is well received by the stomach, owing to the detention in that organ of undigested and partially decomposed food, which readily induces decomposition in whatever is eaten. In these cases one of two things must be done; either the stomach must be allowed to rest until it has become thoroughly emptied, and the mucous membrane has lost something of its irritability, or the stomach must be artificially emptied of its decomposing contents. Washing the stomach by means of the stomach-tube, two or three times a week, is essential to the thorough treatment of this disease.

The stomach may be given rest by means of nutritive enemata, by the use of which life may be prolonged for an indefinite period. Experience shows that food injected into the rectum, although not digested in that part of the alimentary canal, is carried up into the small intestine by a reversed peristaltic movement of the bowels. We not long ago treated a patient for gastric catarrh to whom it became necessary to administer along with the food some remedies of a peculiar color and flavor, as nothing could be retained by the stomach. We were shortly surprised to hear the patient complaining of tasting the medicine administered. We at first supposed the difficulty to be wholly due to the patient's imagination, but upon examination of the matter regurgitated from the stomach we found it to present unmistakable evi-

dence of the presence of medicine injected into the rectum a short time before. The patient continued to expel portions of the medicine by the mouth so long as it was employed and for a few days afterward, the quantity gradually growing less. Physiological experiments have now established the fact above referred to, and nutritive enemata may be employed with the fullest confidence that if they are sufficiently nourishing and properly employed in sufficient quantity the patient will be adequately nourished thereby. Any one of the preparations described under the head of "Nutritive Injections" (p. 737) may be employed for this purpose. On account of the ease with which it may be prepared, the egg preparation (page 741) is to be very strongly recommended.

Lavage.— The perfection of the stomach-tube and the mode of washing out the stomach by means of it, is perhaps the greatest advance which has been made in modern times in the treatment of the disorders of digestion. By means of the stomach-tube, the greatest possible assistance is given in diagnosis. The physician is no longer left to grope in the dark in relation to the nature of the ailment which requires treatment. The character and the quantity of mucus obtained through the stomach-tube renders possible an exact determination in relation to the effect of the presence or absence of gastric catarrh. In severe cases of this disease, the systematic use of the stomach tube is one of the most important of all measures of treatment. By this means the relaxed and usually dilated stomach is easily emptied, not only of the undigested remains of food substances, but also of masses of mucus which are constantly accumulating within it.

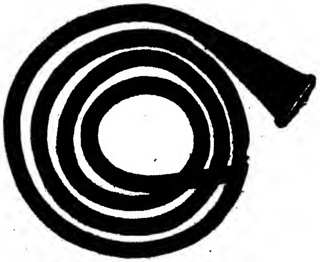


Fig. 275. Stomach-tube.

The accompanying cut (Fig. 275) shows an approved form of stomach-tube, which is used in obtaining a test-meal in the examination of the stomach fluid, and for washing out the stomach when necessary.

The most suitable time for washing the stomach is just before retiring at night, or five or six hours after the last meal. The operation is by no means so difficult and distressing as it might appear. The tube employed is of very soft,

flexible rubber. It is not forced down into the stomach after the fashion of the old stomach-pump, but is simply swallowed as one would swallow a portion of food or a capsule. One end of the tube being introduced into the mouth and passed well back into the throat, the patient makes movements of swallowing whereby the tube is readily carried into the stomach. Water of about the temperature of the body is then poured in, either with or without the addition of common salt and soda in the proportion of a teaspoonful of each to a quart of water. After a pint or so of water has been poured into the stomach, the outer end of the tube is lowered, and by coughing or similar movements the contents of the stomach are forced through the tube into some proper receptacle.

In cases caused by frequently taking cold or long exposure to a damp, chilly climate, the patient should be treated with warm baths, and should take great pains to clothe the body, especially the trunk, very warmly, extra clothing to be worn over the stomach and bowels. Such general measures of treatment should be adopted as will improve the general tone of the system, as the general application of electricity, massage, cool baths not too frequently repeated, etc. Wearing the moist abdominal bandage, called by the Germans the *umschlag,* will be found very excellent in many of these cases. The bandage should be worn night and day for two or three weeks, until a slight eruption appears on the skin, when it may be discontinued for a few days to allow the eruption to disappear. There is no advantage in establishing large, suppurating sores about the body, as was done in the old-fashioned water-cure practice and is still recommended and practiced by some unscientific hydropaths. Hot fomentations over the stomach for a few minutes just before or just after a meal are useful for these cases. Probably the best of all simple measures is the use of alternate hot and cold applications to the spine, just back of the stomach. A celebrated London physician recommends the use of large linseed poultices covering the stomach and bowels an inch thick, to be worn during the night. We have never found it necessary to resort to this method, believing that the same effect is obtained by the use of the abdominal bandage. In cases of great acidity of the stomach the patient will often find much relief by the use of finely pulverized charcoal, or charcoal tablets. The dry pulverized charcoal is, however, inconvenient. It may be taken as powder, or stirred in a little water. A tablespoonful of charcoal taken immediately after the meal will frequently prevent acidity.

For a number of years we have employed systematic lavage of the stomach in these cases with excellent success. The lavage should be employed daily or every other day, so long as any quantity of mucus is removed by the washing. Replacement and massage of the prolapsed and dilated stomach should be practiced daily. The hot and cold trunk pack and the moist abdominal bandage should be constantly employed, and charcoal, or better, charcoal tablets (page 1592) should be taken after each meal.

DILATATION OF THE STOMACH.

SYMPTOMS.— Water-brash; heartburn; flatulence; cramp; fickle appetite; constipation; abdominal enlargement; occasionally vomiting of great quantities of sour matters resembling yeast.

Causes.—Dilatation of the stomach usually results from some obstruction to the passage of food into the intestine. This may be due to contraction of the pyloric opening, or to inactivity of the muscular walls of the stomach, which do not contract with sufficient force to expel the contents of the organ. This condition is a frequent accompaniment of cancer of the stomach. It is also sometimes the result of chronic gastritis. It occurs most often in gluttons and drunkards.

Recent investigations, particularly those of Bouchard, which have been amply verified by the author, indicate that this condition is very much more common than was formerly supposed. Most women who have worn the ordinary conventional dress until twenty-five or thirty years of age, suffer from some degree of prolapse or dilatation of the stomach, and many of the inconveniences resulting from this condition.

Treatment.—This disease is an obstinate one, and in extreme cases cannot be cured. Much can be done to relieve the patient, however, and by persistent and thorough treatment a cure can sometimes be effected. The patient should eat only the most simple foods, such as are easy of digestion, and in the smallest quantity capable of sustaining life. Soups, and liquid foods of all kinds, should be avoided, as the absorption of fluids in this condition is very slow. The diet should consist chiefly of dry food which requires very thorough mastication.

Examination of the stomach fluid, in cases of dilatation of the stomach, shows hypopepsia or apepsia to exist in nearly all cases. This indicates that the gastric juice produced is inferior in quality and deficient in quantity. Meats of all sorts should be avoided,

especially fish and oysters. The following articles of food will be found especially adapted to this class of cases: —

Kumyzoon, granose, granola, malted gluten, lac vegetal (page 1633), zwieback, unfermented breads, eggs simply prepared (eggs do not always agree), peas, beans, lentils purée, green peas, rice, and well-cooked sweet fruits eaten without sugar. Acid fruits must be avoided, also meat, fish, and especially oysters, as these substances undergo decomposition when long retained in the stomach.

Systematic washing of the stomach by means of the stomach-tube is essential and in very bad cases it must be employed daily and for an indefinite time. In cases in which the stomach and bowels are prolapsed, an abdominal supporter must be worn. Apply a fomentation over the stomach at night, and the moist abdominal bandage to be worn during the night. Take a cool sponge bath and follow with an oil rubbing, on rising in the morning.

GASTRALGIA, OR NEURALGIA OF THE STOMACH.

SYMPTOMS.—Severe pain of the stomach, at times extending back; stomach distended or retracted; vomiting, either at the beginning or close of the attack; sometimes a slight relief by pressure.

The pain of this disease is most acute. The patient fears that he is dying. In severe cases, patients complain of a clutching, tearing pain. It seems to begin at the lower part of the breast-bone. Vomiting may occur either at the beginning or the close of the attack. It lasts from a few minutes to several hours, leaving the patient thoroughly exhausted. Notwithstanding the excessive pain suffered, however, the attack is never fatal.

Causes.—Neuralgia of the stomach is generally produced by errors in diet, such as overeating, eating indigestible food, insufficient mastication of food, hot drinks, iced cream, tea and coffee, and alcoholic liquors. The disease is very frequent in Sweden, owing to the great use of spirits and coffee in that country. It is also induced by excessive venery and masturbation. Malaria is not infrequently a cause of the disease. It is frequently present in hysteria and other nervous diseases, and is often an accompaniment of catarrh of the stomach. It also results from chronic ulcer of the stomach, dyspepsia in its various forms, and diseases of the generative organs. It is most common in females.

Treatment.—The patient must take a simple, unstimulating diet, abstaining entirely from alcoholic drinks of all sorts, and from tea and cof-

fee. Upon the occurrence of an attack, apply heat to the stomach and abdomen, and also to the extremities. If the pain is not promptly relieved, call a physician. The use of opiates should be avoided, if possible.

Large doses of subcarbonate of bismuth, twenty to thirty grains, repeated every half hour, are useful in some cases. An examination of the stomach fluid should be made. (See page 1619.) If the gastric juice is abnormally acid, fifteen to twenty grains of bicarbonate of soda, dissolved in a little water, may be taken after eating. Stomach washing is useful in many cases. Avoid flesh food. A diet of kumyss or buttermilk, is advantageous.

CHRONIC ULCER OF THE STOMACH.

SYMPTOMS.—Pain in stomach and in spine opposite, increased by food, especially hot drinks and sugar; tenderness of abdomen, particularly over the stomach; violent beating at pit of stomach; vomiting; tongue ridged and furred; often great thirst; constipation.

Ulcer of the stomach is a much more common disease than is generally supposed. Many cases supposed to be merely neuralgia of the stomach are really chronic ulcer, it being very easy to confound the two diseases. The ulcer may be very small in size, not more than one-fourth of an inch in diameter, or may extend until it becomes as large as the palm of the hand. Sometimes the ulcer encircles the stomach like a band.

Causes.—The chief causes of ulcer of the stomach are obstruction of the circulation and errors in diet, particularly the use of very hot or cold food, and of liquor, tea, and coffee.

Treatment.—The disease is rarely a fatal one. The patient sometimes dies of hemorrhage, perforation of the walls of the stomach, or peritonitis. Unless efficient treatment is applied, the disease is liable to continue for many years. The dietetic treatment of the disease is of the greatest importance. The patient must avoid all kinds of irritating food, particularly hot and cold drinks, sugar, acids, and food which is capable of producing mechanical irritation, such as vegetables, bread made from coarse flour, etc. The diet should consist of such liquid foods as milk, alone or with fine-flour bread, gruels, well-boiled and strained, etc. (see "Liquid Dietary," Appendix). In very serious cases, entire rest must be given the stomach, the patient being nourished by nutritive enemata. (For other treatment, see "Chronic Gastritis.") This measure may be resorted to in connection with restricted diet, or as an exclusive means of sustaining the patient. Perhaps there

is no way by which so speedy a cure can be effected as by giving the stomach entire rest. When there is gas in the stomach it may often be relieved by the use of freshly burned charcoal taken in powder. The tube may be used, taking care to avoid injury to the ulcerated tissues. The possibility of hemorrhage should not be forgotten. Examination of the stomach fluid made in these cases invariably shows hyperpepsia, with excessive acidity of the gastric juice. This requires the use of alkalies. When food is taken by the stomach, fifteen or twenty grains of bicarbonate of soda, and twenty to thirty grains of subcarbonate of bismuth should be taken before eating.

The other symptoms which accompany this disease should be treated in accordance with the suggestions already made in connection with the treatment of disorders of digestion.

HEMORRHAGE OF THE STOMACH.

SYMPTOMS.—Blood vomited in considerable quantities; blood not frothy, and of dark color; blood usually in clots, and mixed with portions of food; uneasiness or other symptoms pointing to the stomach and bowels; black stools.

Vomiting of blood is the most characteristic symptom. Usually blood coming from the stomach is mixed with portions of food, which is also a means of distinguishing it from hemorrhage of the lungs. Notwithstanding the apparent loss of immense quantities of blood in hemorrhage from the stomach, the majority of patients recover under the employment of proper measures.

Causes.—Hemorrhage of the stomach is most commonly caused by the rupture of blood-vessels, due to ulceration. In chronic ulcer of the stomach, and cancer, this is a prominent symptom. It may also be caused by intense congestion due to pressure, and by mechanical obstruction of the circulation in the chest, caused by disease of the lungs and pleura. It is also an occasional symptom in scurvy.

Treatment.—The stomach should be given absolute rest. No food should be taken for at least forty-eight hours, and in severe cases the stomach must be given entire rest for some time, at least until the symptoms of bleeding have entirely disappeared, the patient being nourished in the meantime by nutritive enemata. The best measure of treatment is cold. It should be applied externally by means of ice compresses; internally, by giving the patient small pieces of ice to swallow, or frequent sips of iced water. The patient may also be allowed to take lime-water

or the serum of milk which has been coagulated with lime. Very little good generally comes from the use of astringents, however, as they are almost invariably vomited as soon as swallowed. Bleeding and the use of morphia are dangerous measures to employ, and their adoption in this disease has often proved fatal. Keep the patient in bed.

Hemorrhage of the stomach may generally be controlled by giving the organ absolute rest. No food or fluid should be introduced into the stomach, except small bits of ice. No food should be taken for some days. In case there is distinct evidence of ulceration, it may be necessary to withhold food for a week or two. Sustain the patient by means of enemata (page 1596). In one case in which we succeeded in effecting a complete cure, the patient was thus sustained for three weeks. When the patient begins to take food, the diet should consists of fluid or thoroughly disintegrated food, which will pass quickly out of the stomach. Kumyzoon, malted gluten, granose, granola, and other well disintegrated foods (see page 1625) should constitute the exclusive dietary. Hemorrhage from the stomach should not be mistaken for bleeding from other organs, as from the lungs or air-passages. Not infrequently blood is vomited which had been swallowed during bleeding at the nose, sometimes during sleep.

CANCER OF THE STOMACH.

SYMPTOMS. *— Pain at the pit of the stomach of a burning or gnawing character, increased by food; tenderness on pressure over the stomach; nausea and frequently vomiting, the vomited matters often resembling coffee grains; hard, pulsating tumor felt near the pit of the stomach; great emaciation; tawny yellow complexion; symptoms of enlargement of the stomach; great exhaustion; swelling of the ankles; sometimes general dropsy.*

The disease is often somewhat obscure, very few of the characteristic symptoms mentioned being present. Sometimes the only symptom observable is gradual emaciation which does not yield to any treatment. In such cases, of course, diagnosis is impossible. In many cases a positive diagnosis is very difficult, the most skillful physicians not infrequently making a mistake after the most careful examination.

No other organ of the body is so frequently affected by cancerous disease as the stomach, but the causes of cancer of this organ are not well understood. It is probable that the true causes are chronic gastritis, ulcer, and dietetic abuse of the organ, particularly the use of alcoholic liquors.

The disease seems to be hereditary in some families. The father

of Napoleon I., his sister, and himself, all died of this disease. Cancer of the stomach also frequently occurs subsequent to cancer of some other organ. We have frequently observed this in cancer of the breast, particularly after operations for removal of the breast in cancerous disease.

Treatment.—Cancer of the stomach is most likely to be confounded with chronic gastritis and ulcer of the stomach, from which it is sometimes very difficult to distinguish it. The disease is, of course, incurable, but by careful treatment the patient's life may be prolonged and his suffering greatly mitigated. As there are no curative measures which can be used with any prospect of success, we are confined to the use of palliative remedies. The same measures of treatment should be employed in this disease which have been recommended in extreme cases of chronic catarrh, enlargement of the stomach, and gastric ulcer. When the disease has progressed to a considerable degree, the offensive discharges may be very much diminished by the use of charcoal or **charcoal tablets.** The patient's sufferings are often so great that the use of opiates for relief is advisable. They should, of course, be given under the direction of a physician. The stomach-tube or syphon apparatus is exceedingly serviceable, as by its use the stomach may be cleansed of foul matters, which are usually absorbed into the system to a considerable extent, hastening a fatal result by general poisoning. Constipation of the bowels should be relieved by injections of tepid water.

DEGENERATION OF THE PEPTIC GLANDS.

***SYMPTOMS.**—Loss of appetite: impaired digestion: gradual emaciation and increasing debility: morbid condition known as degeneration of the glands which secrete the gastric juice: death by exhaustion.*

The only morbid symptoms are those mentioned. No special causes of this disease have been determined, but there is no doubt that the use of alcoholic liquors and tobacco, together with the causes which produce degeneration in other organs, cause degeneration of the peptic glands.

Treatment.—Little can be done for patients suffering with this disease. Only the most simple and easily digested foods should be employed. This condition is usually connected with dilatation or cancer of the stomach, and the same measures of treatment recommended for those conditions are applicable to this disease.

DIARRHEA, INTESTINAL CATARRH, OR INFLAMMATION OF THE BOWELS.

SYMPTOMS.*—ACUTE : *Looseness of the bowels; pain in abdomen, either colicky or continuous; purging; nausea; vomiting; coated tongue; foul breath; flatulence; eructations of gas; loss of appetite; headache; sometimes chill followed by fever.

CHRONIC : ***Diarrhea, alternating with constipation; discharges from the bowels thin, greenish-yellow or nearly colorless, usually containing considerable mucus; sometimes, cylindrical casts; thirst; high-colored urine; discomfort after eating; emaciation.***

Intestinal catarrh, generally known as *enteritis*, is a very common disease, especially in warm climates and in temperate climates during the warm season. The inflammation most commonly affects the small intestine, either of the three portions of which, the duodenum, the ileum, or jejunum, may be affected separately or together. The disease is sometimes confined to the large intestine and is known as *colitis*, or to the lower part of the cæcum, when it is called *typhlitis*. When it affects the rectum only it is known as *proctitis*. Occasionally the whole intestinal tract is affected at once.

Causes.—These are chiefly irritation from indigestible food, as unripe fruit, stale vegetables, food which has begur to undergc decomposition, poisons, irritating medicines, etc. Among the causes may be mentioned also the irritation produced by retained fece as in chronic constipation. Mechanical injuries to the bowels, as fron blows or straining, may produce intestinal catarrh. We have good reason for believing also that it is produced by "taking cold," like catarrh of the air-passages. Among other causes may be mentioned congestion of the liver, diseases of the heart and kidneys, and consumption. Sometimes severe intestinal inflammation occurs after extensive injury to the skin by burning. The disease is especially frequent in infants. Recent investigations indicate that this disease may be caused by the sudden manifestation of virulence or malignancy on the part of the microbe known as *bacillus coli*, which is constantly found present in great numbers in the large intestine. The catarrhal affections of different portions of the intestinal canal indicated by characteristic symptoms, with the exception of those of—

Typhlitis.—This is a form of the disease in which the lower part of the cæcum, often including the appendix vermiformis, presents a swelling low down on the right side which is accompanied by considerable pain and obstinate constipation. Usually the swelling finally disappears, the contents being discharged into the bowels; but sometimes the wall of the intestine is perforated and the contents dis-

charged into the abdominal cavity, which is a fatal accident. In other cases the perforation is external, the contents being discharged through a fistulous opening.

Catarrh of the rectum, which very frequently occurs, closely resembles dysentery.

The disease is not dangerous except in infants and persons advanced in years.

Treatment.—The regulation of the diet is of the first importance in this as in most diseases of the digestive organs. The patient should abstain entirely from the use of vegetables, cheese, and meat. The diet should consist chiefly of milk, the yolk of egg, oatmeal, granola, granose, and other cereal foods, simply prepared and very carefully masticated. Fats and fat meats of all sorts should be carefully avoided. Next in importance as a measure of treatment, is the proper employment of enemata. We have seen more benefit derived from the injection of large quantities of hot water—as hot as could be borne, and in as large quantities as could be retained—than from any other single measure of treatment. Fomentations to the bowels should be applied once or twice a day, and the abdominal girdle should be worn night and day. The patient should take great care to thoroughly clothe himself, wearing woolen undergarments the year around. Cathartics and emetics should be scrupulously avoided. When the disease is produced by cold, it is best treated by sweating baths, as the Russian, Turkish, vapor, or hot-water bath. The warm-blanket pack is also an excellent remedy in these cases. The hot or cold water used in injections should be employed in considerable quantities, either as hot as can be borne or quite cool. Dr. Mesmer, an eminent physician, employs cold-water injections altogether. We have used both hot and cold water successfully in both acute and chronic diarrhea, sometimes one and sometimes the other being best adapted to the particular case. If one does not give relief, the other should be tried. The physician mentioned employs in acute diarrhea about one quart of iced water at a time, injecting it slowly, and having it retained as long as possible. Cool sitz baths employed daily for from fifteen to thirty minutes, the temperature being gradually lowered from 92° to 85°, are an excellent means of treatment in chronic intestinal catarrh. In the acute form of the disease, when fever is present, and there is evidence of considerable inflammation, the cool wet-sheet pack, and continuous application of cold compresses over the bowels, are excellent measures

of treatment. Vomiting and other symptoms should be treated as when they occur in connection with other diseases. When symptoms of typhlitis, or catarrh of the rectum, appear, applications of ice compresses should be made to the parts affected during the first stages of the disease, but after it becomes evident that suppuration must take place, the ice compresses must be exchanged for fomentations, so as to hasten suppuration, and thereby terminate the disease. In cases of this sort, a skillful surgeon should alway be called in, as a surgical operation is sometimes the only means of saving the patient's life. In cases of catarrh of the lower bowel, either acute or chronic, give injections of tannin, a dram to the quart of water, either with or without the addition of starch.

ACUTE DYSENTERY.

***SYMPTOMS.** — Diarrhea; chilliness or rigor, followed by fever; severe pain in the bowels; constant desire to stool; burning pain in the rectum; watery or mushy discharge, with considerable quantity of tough mucus, which is often streaked with blood; pain, not removed by movement of the bowels; jaundice; headache, dizziness, ringing in the ears; inability to sleep; little appetite; great thirst; tongue at first white, afterward smooth and slimy; bowels painful to the touch; putrid discharges.*

Causes. — Acute dysentery occurs in two forms,— in isolated cases, in which the disease originates spontaneously, and is not communicated to others; and in epidemics in which large numbers of persons are affected at once, the disease seeming to be communicated from one to another. The symptoms in the course of the two diseases are essentially the same, the isolated cases generally being milder in character, however. The principal causes of dysentery are decayed or irritating food, unripe fruit, imperfect mastication, indigestion, constipation of the bowels, and taking cold. Epidemic dysentery is caused by germs. This disease is unquestionably due to germs, the exact nature of which, however, has not been fully determined.

Treatment. — The disease is generally quite easy to manage if taken in time and treated vigorously. In the treatment of cases of epidemic dysentery the first thing to look after is the prevention of the extension of the disease to those not yet affected by it. This may best be done by thoroughly disinfecting the discharges of the patient by chlorate of lime, or permanganate of potash, and requiring the observance of careful dietetic rules. All kinds of food which occasion constipation of the bowels, such as fine-flour bread, potatoes and other starchy vegetables, and, in some cases, milk, must be avoided alto-

gether. At the beginning of the disease, where there is evidence of the presence of undigested food in the stomach, the stomach should be relieved by the use of a large warm-water emetic. The quantity of food should be restricted to the smallest amount compatible with comfort. Ripe fruits, especially grapes, and most stewed fruits, may be used in abundance to keep the bowels regular. Salads, spices, and other condiments, fats, fried foods, and large quantities of meat, should be strictly avoided, together with tea, coffee, and all other narcotics.

The patient should remain quiet, preferably in bed, although he feels able to go about the room. He should be carefully protected from changes of temperature. The diet should consist chiefly of simple soups, well-boiled oatmeal gruel, egg beaten up with water or a little milk, and similar foods. No cold foods should be taken. In many cases, regulation of the diet is sufficient. Care respecting the diet should be exercised over the patient not only during sickness but in convalescence, the patient being confined to the simplest articles of food and required to abstain from the use of meat until health is fully restored. Colicky pains in the bowels should be treated by means of fomentations. They should be applied as often as necessary. Ice-cold compresses are also recommended. This is a useful remedy, but more are benefited by the use of hot applications than by cold. Either the hot or the cold enema may be employed as recommended for diarrhea. Both plans are successful. In the children's hospital in Vienna, injections of iced water into the rectum is a favorite remedy. The tannin injections, as recommended for the preceding malady, are of great value in these cases.

The use of opium, which is exceedingly common in this disease, is not advisable, as it produces a feverish condition of the system, decidedly prejudicial to recovery. Herrvner, an eminent German physician, very strongly discourages the use of opium in this disease. If the other treatment is applied thoroughly, it will rarely be thought necessary.

In mild cases, the wet abdominal bandage, sometimes called Neptune's girdle, is all that is necessary to relieve the abdominal pain and check the disease process. In cases in which absolute rest is not demanded, the shallow, cool sitz bath may be used several times a day.

CHRONIC DYSENTERY.

SYMPTOMS.—Looseness of the bowels, with discharges of mucus; burning pain in the rectum; abdominal dropsy; emaciation.

Chronic dysentery is usually the result of an attack of dysentery from which the patient has partially recovered, though sometimes the disease comes on insidiously. The general principles of treatment are the same as those in the acute form of the disease. In addition, astringent injections may be used with much advantage, such as solution of tannin, sulphate of zinc, alum, or nitrate of silver. The latter is an excellent remedy, and should be used in the proportion of about four grains of nitrate of silver to a goblet of hot water. Chlorate of potash is also an excellent remedy. It may be used in the proportion of ten grains to an ounce of hot water. Soothing injections are likewise of great service, especially in the acute form of the disease, such as linseed tea, thin starch, or mucilage-water enemata.

The daily hot enema and tannin injections, as recommended for chronic diarrhea, are of great value in these cases; also rest in bed and the employment of the same diet as recommended for diarrhea.

COLIC—ENTERALGIA.

SYMPTOMS.—Griping pain in the bowels, especially about the navel; pain, spasmodic in character, generally relieved by pressure; no tenderness of the bowels; frequent vomiting; bowels usually constipated, and frequently flatulent; no fever; pulse generally slower than usual; skin cold.

The term colic is properly applied to a spasmodic muscular contraction of the walls of the intestines, but on account of the difficulty of distinguishing the two conditions, it is often also applied to a neuralgic affection of the intestines known as enteralgia. The disease is usually caused by indiscretions in eating, as of unripe fruit, stale or decaying vegetables or other food, certain kinds of fish, or by taking cold, etc. The disease is often a very painful one, leaving the patient much prostrated, but is never fatal. The application of hot fomentations or dry heat to the abdomen, and the use of large hot enemata, rarely fail to give speedy relief. In cases of chronic enteralgia such as are sometimes met with, nothing is so effective as the use of electricity in the form of a mild faradic current or galvanism.

LEAD COLIC.

SYMPTOMS.—The usual symptoms of lead-poisoning; skin dingy; teeth discolored; bad breath; metallic taste in the mouth; obstinate constipation.

The most successful treatment of lead-poisoning is that of a preventive character. Lead pipes or vessels should not be used for conveying or holding water. Workmen engaged in industries which expose them to the fumes of lead or to fine particles of lead in the air, should protect themselves by good ventilation, respirators, etc. Particular pains should be taken to prevent the entrance of the poisonous metal into the throat, or the food and drink. In cities where lead pipes are used, water should be allowed to run some time before using, in order to empty the pipes of the water standing in them. Tin vessels used for containing milk should be carefully tested before being used. Vessels lined with enamel should be tested before they are used for cooking purposes. Tin cans in which fruits are put up should also be submitted to the test, as they are frequently made of the poorest kind of lead tin. The bowels and excretory organs should be kept open by water-drinking. Warm baths, especially the hydro-galvanic bath, should be assiduously employed. It has been stated on good authority that in cases of lead-poisoning, lead has been found in the water in which the patient had taken the bath, the metal having been eliminated from the system by the aid of the galvanic current. Biliary colic and renal colic will be referred to in connection with diseases of the liver and kidneys.

CONSTIPATION OF THE BOWELS.

SYMPTOMS.—Inactive condition of the liver; movement of the bowels infrequent or wholly suspended without artificial aid; inactive condition of liver and kidneys, indicated by scanty urine and pale color of feces; skin dry and sallow; breath foul; mind depressed; headache; neuralgia; palpitation of the heart.

Constipation of the bowels is one of the most frequent disorders of the digestive organs. The principal causes of the disease are sedentary habits, concentrated diet, and the use of tea, coffee, tobacco, and beer. Some of the most obstinate cases of constipation are produced by the long-continued use of opiates. It is also frequently the result of other disorders of these organs, as chronic intestinal catarrh, stricture of the intestines, partial paralysis or inactivity of the muscular walls of the intestines, etc. Another cause which is worthy of mention is neglect to evacuate the bowels when the desire is felt. The contents of the bowels

are gradually carried down to the rectum, and when they reach this point there is generally a desire to relieve the bowels. If the duty is at once attended to, the habit of evacuating at a regular hour soon becomes fixed. If the call of nature is unheeded, however, the feces are carried upward by peristaltic action into the colon again, so that the desire passes away. By long neglect, the bowels may get into such an abnormal condition that the desire to relieve them will never be felt. The bowels act very differently in different persons. In the majority of cases the bowels move about once each day. Others require two movements a day. In still others the interval is prolonged to two or three days. In occasional instances the bowel movements occur but once a week, notwithstanding the person enjoys perfect health. It is astonishing how long the contents of the bowels may sometimes be retained. While a student in Bellevue Hospital, New York, we learned of the case of a man who had no movement of the bowels for three months. He was then obliged to devote himself to the duty of emptying the bowels for three or four weeks, and lost in that time forty pounds which he had accumulated. Last, but not least, among the causes of constipation should be mentioned the habitual use of laxatives or cathartics in the shape of "dinner pills," "purgative pills," etc.

The results of constipation of the bowels are often very serious. The accumulation of fecal matter in the bowels obstructs the portal circulation and induces disorder of nearly all the abdominal organs. The liver and kidneys become inactive through mechanical obstruction, the stomach becomes affected, and the pancreas and spleen participate in the general disorder, having their functions very greatly impaired. The circulation in the lower limbs is also interfered with by pressure on the large veins which return the blood from the lower part of the body, occasioning numbness and coldness of the feet and legs, which is an almost constant accompaniment of this disease. Absorption of the decomposing fecal matter also takes place to some extent, giving rise to foulness of breath; and the poisoning of the nerve centers occasions great mental depression, headache, confusion of thought, neuralgia, and a great variety of symptoms. One of the most common and painful results of chronic constipation is *hemorrhoids*, or *piles*. They arise from obstruction of the circulation due to fecal matter in the bowels. As these generally require the use of surgical measures for relief, we notice the subject but briefly here.

Treatment.—Even the most obstinate constipation not dependent

on structural lesion of the intestines, can generally be relieved by thorough rational treatment. In the first place, all the causes of the disease must be carefully avoided. If the patient's habits have been sedentary, he must take abundant exercise by walking, riding, etc. Horseback and bicycle riding are useful in this disease. Another excellent measure in such cases is vigorous kneading and percussing of the abdomen several times a day for five or ten minutes at a time. Many obstinate cases of constipation have been cured by this means alone. Eating an orange before breakfast, or drinking a glass or two of cold water, are simple measures which have sometimes proved effective. The diet should be carefully attended to. Unless there is some disease of the stomach, such as ulcer or painful dyspepsia, coarse food should be used. Very little animal food should be taken. The diet should consist of fruits, unbolted meal, and granose. An attempt should be made to relieve the bowels, whether there is any inclination or not. The time at which movement is most likely to be secured is after breakfast. With some persons, however, the movement occurs immediately upon rising. Hot applications to the abdomen, the use of alternate hot and cold applications to the lower part of the spine, the employment of the abdominal girdle, and cool sitz baths daily, or every other day, are measures of great value in the treatment of this condition. In the treatment of obstinate cases, we have often secured great benefit by the employment of electricity and Swedish movements. Electricity should be applied directly to the bowels sufficiently strong to occasion slight contraction of the abdominal muscles. When the patient has been for a long time dependent on laxatives of some sort, enemata of tepid water should be substituted. Common salt or soap may be added to the water if necessary. Oil or glycerine injected at night and retained, is useful; also the sinusoidal current. The bowels should not be allowed to move when the contents have become hardened by long retention without taking large enemata. In cases of piles the patient will find relief by evacuating the bowels while sitting over a vessel filled with water as warm as it can be borne. By means of the simple measures mentioned above we have relieved cases in which there has been no natural movement of the bowels for from ten to twenty years.

INTESTINAL HEMORRHAGE.

SYMPTOMS. *– Bloody discharges from the bowels, either pure or mixed with natural discharges; when the bleeding is excessive, fainting and other symptoms will usually result from loss of blood.*

The most common cause of intestinal hemorrhage is hemorrhoids, or piles. Hemorrhage from the bowels also frequently occurs in connection with ulcer of the stomach, cancer of the bowels, typhoid fever, dysentery, and some other diseases. If the bleeding is severe, it probably originates from some other cause than hemorrhoids. It is imperative that the most complete rest should be maintained. Ice compresses should be applied to the abdomen, and iced water should be injected into the rectum. The patient may be allowed to swallow small bits of ice, but little good can be accomplished by remedies taken into the stomach, as they will not be likely to reach the seat of hemorrhage until too late to be of any value. When the bleeding comes from piles, the application of ice compresses or of bladders filled with iced water should be made to the affected part. When bleeding is habitual, it is very important that the patient's diet should be regulated carefully. He should abstain from meat almost entirely; the less eaten, the better. Eggs may be eaten once a day, but vegetables, fruits, and grains should be the principal diet. If the bleeding is supposed to come from plethora, the suggestions made for the relief of that condition should be carefully followed. It is of especial importance that the patient should abstain from all kinds of spirituous liquors, fat meats, and, in fact, meats of all kinds. Enemata of ice-water may be employed, also astringent solutions, such as tannin in the proportion of a dram to the pint, or ferric alum solution of the same strength.

INTESTINAL OBSTRUCTIONS.

SYMPTOMS. *—Persistent vomiting; vomiting of fecal matter; extreme pain; distention of the bowels with gas; hiccough; constipation of the bowels; mental depression; great prostration; tumor, which can be felt through the abdominal walls.*

The causes of intestinal obstruction may be divided into six classes, as follows:—

Compression.—This cause of mechanical obstruction of the intestines may result from morbid growths of any sort, as various forms of tumor, including cancer, or from a displaced uterus. We have within a week of the date of this writing met with a remarkable case in

which the last-mentioned cause occasioned the most obstinate constipation for many years. The lady had received treatment from many physicians for a period of eight years, but without relief. During this time there had rarely been a movement of the bowels without the employment of laxatives of some kind. She was in the habit of taking senna at night for the purpose of securing an evacuation of the bowels the next morning. Upon making an examination of the womb, it was found to be completely retroverted, or tipped backward, thus pressing upon the rectum in such a way as to form an obstacle to the downward passage of the contents of the bowels.

Contraction.—One of the worst forms of obstruction is due to stricture or contraction of the intestine, caused by chronic catarrh, dysentery, cancer, or chronic ulcer of the intestine. This kind of obstruction occurs most frequently in the rectum or lower part of the bowels. It is indicated by great difficulty in moving the bowels and the small size of the stools, when formed.

Twisting.—In some manner not easily understood, the small intestine sometimes becomes twisted upon itself so as to form an obstruction. So slight a degree of twisting as one-half rotation is said to be sufficient to close the canal.

Internal Strangulation.—This is one of the worst forms of mechanical obstruction, as it consists in the entanglement of an intestine in a fissure between bands of inflammatory tissue, or the formation of a sort of knot in the intestine itself.

Intussusception.—This form of obstruction is produced by the intestine being invaginated, or folded into itself. One cause of this accident is chronic diarrhea. It is most frequent in children, especially in children suffering with *hydrocephalus*. The occurrence of this accident is usually indicated by severe pain felt over a certain spot in the abdominal cavity. A tumor may also be generally felt at the seat of pain indicating the point of obstruction.

Hardened Feces.—This cause of obstruction is one which should not be overlooked, as it is one which is not infrequent. Cases are often met in which the feces accumulated in the lower part of the bowels are so hard and dry that they cannot be dislodged by the ordinary efforts of nature. Occasionally, also, stony concretions form in the intestines, of sufficient size to obstruct the intestinal canal. These are generally the result of the use of chalk or magnesia in large quantities,

or of accumulations the nucleus of which consists of gall stones or foreign bodies which have been swallowed, such as coins, cherry or plum pits, seeds of raisins, etc. *Rupture*, or *hernia*, is another cause of intestinal obstruction, but as this properly comes under the head of surgery it will not be considered here.

Treatment.—The treatment of intestinal obstruction depends, of course, upon the cause. If the obstacle consists in morbid growths within the abdominal cavity, little can be done to ameliorate the patient's condition. If it is simply a retroverted or displaced uterus, the remedy is simple and easy of application when the nature of the difficulty is understood. Contractions situated near the anus can be relieved by dilatation. When out of reach, nothing can be done except to confine the patient to a fluid diet, which will have a tendency to produce thin and pulpy stools. Milk and lime-water, beef-tea, eggs beaten with milk, and similar food should compose the diet. For twisting, internal strangulation, and intussusception, the best mode of treatment is distention by means of air or cold water. This remedy is of no account unless used very thoroughly. It is generally necessary to pump into the intestine a very large quantity of air or water. If the patient is a child, it is generally best to place him in a dependent position, with the head downward, as by this means the weight of the water may be made to act most advantageously in relief of the obstruction. For adults, employ the knee-chest position. If the patient is not speedily relieved, consult a skilled physician.

.When symptoms of inflammation occur, as indicated by the pulse, rise of temperature and local pain, ice compresses should be applied to the abdomen continually. The danger of death in these cases is very largely increased by the use of laxatives or purgatives, as remedies of this kind will be sure to increase the difficulty. When the obstruction is produced by accumulations of fecal matter in the rectum or colon, it is generally necessary to remove the obstruction by inserting the finger, handle of a spoon or any convenient instrument. After an opening has been worked through the accumulated mass, a copious injection of warm soap-suds made from castile soap may be made by means of the syphon syringe or any other convenient instrument. The injected fluid should be retained as long as possible, and then expelled. Repeated injections may be employed if necessary.

PERITONITIS—INFLAMMATION OF THE BOWELS.

SYMPTOMS.—ACUTE: *Pain in the abdomen; chill or chilliness followed by fever; great tenderness over whole abdominal wall, increased by muscular action and by slight pressure; constipation of the bowels; vomiting; hiccough; patient lies on the back with the knees drawn up; cold, clammy sweats.*

CHRONIC: *Slight pain in abdomen; obstinate diarrhea; occasional attacks of colic; abdomen rigid, swollen, and tender; emaciation.*

Peritonitis is inflammation of the serous membrane which lines the cavity of the abdomen and covers the intestines. The causes of the disease are the same as those which occasion inflammation of other serous membranes, as of the pleura of the lungs. It frequently also results from perforation, or from inflammation and ulceration of the mesenteric glands.

Treatment.—The acute form of the disease requires absolute rest, together with remedies calculated to lower the inflammatory action. The abdomen should be covered with cold compresses which should be wrung out of ice-cold water and changed every ten minutes. Cool injections into the bowels may also be employed for the same purpose. Some cases are more readily relieved by the application of hot fomentations to the bowels and hot enemas. The treatment should be applied very thoroughly. The diet should be simple, consisting by preference of kumyzoon, gruels, and granola or rice. Solid animal food should be withheld, also vegetables. If vomiting is present, give neither food nor drink. Move the bowels thoroughly with a soap enema and seltzer. For the chronic form of the disease, apply fomentations two or three times a day. For breaking up adhesions which may have formed, the alternate hot and cold applications in the form of compresses, the douche, or spray, is an excellent measure of treatment. Daily hot enemata are also useful.

ABDOMINAL DROPSY—ASCITES.

SYMPTOMS:—Abdomen enlarged; skin tense and shiny; a sensation of fluid when felt by the hand; short breath; generally swelling of the lower extremities; weakness; emaciation, especially of the upper part of the body; loss of appetite; sleeplessness; patient cannot lie down on account of disturbance of breathing.

Dropsy of the abdomen is not itself a real disease, being simply a symptom of disease. It is most commonly found in general dropsy, but in this connection we refer to cases in which it is present without general dropsy. These cases are the result either of obstruction to the

portal circulation from disease of the liver, obliteration of the portal vein, cancer or tuberculosis of the peritoneum, or in women, fibroid tumor, or cancer of the womb or ovaries. The most common cause of abdominal dropsy is hardening or cirrhosis of the liver, or other forms of degeneration of that organ, which most commonly result from the use of alcoholic liquors. Abdominal dropsy should be carefully distinguished from simple accumulations of fat in the abdominal walls, which is very frequent in advanced life in people of a lymphatic temperament, accumulations of gas in the intestines, and, in females, ovarian dropsy. We have met with cases in which each one of these conditions has been mistaken for dropsy of the abdomen. The first condition is very easy to distinguish from accumulations of fluid in the abdominal cavity. The same is true of accumulations of gas in the intestines. By simply placing one hand on the abdominal wall and tapping upon one finger with the finger of the other hand, a drum-like resonance will be observed which indicates the presence of gas instead of fluid. Care should be taken, however, to observe whether the resonance extends to the space between the lower ribs and the upper part of the hip-bone. When no fluid is present there is resonance at this point on both sides of the body, but in cases of dropsy of the abdomen the water settles down into this part as the patient lies on his back, the inflated intestines floating and producing a resonance only at the upper part. It is not difficult to distinguish cases of ovarian dropsy or cystic tumor of the ovary from this disease. The best distinctive sign is a reversal of the order just described, the fullness being at the upper part of the abdomen, while resonance is found in the space described between the hip-bone and lower ribs, showing that the fluid is inclosed in a sac separate from the general cavity of the abdomen. In cases in which there is any doubt as to the presence of fluid in the abdominal cavity the question can be easily settled by means of a hypodermic syringe.

It is sometimes difficult to decide which one of the two principal causes of abdominal dropsy is active in any particular case. It may be said, however, that when there are other evidences of disturbed action of the liver it is safe to attribute the dropsy to disease of this organ. Disease of the liver is frequently indicated by dark-colored urine which upon chemical examination is found to contain bile. In cases in which none of these symptoms occur, the dropsy is generally due to degenerative disease of the peritoneum.

Treatment.—The treatment of ascites should be, of course, to re-

move the cause as far as possible. In many cases, unfortunately, this cannot be done, as in degeneration of the peritoneum and cirrhosis of the liver. Much, however, can be done for the relief of the patient, and not infrequently a cure can be effected. Attention should first be given to the general health of the patient. The diet should be carefully regulated. The food should be nourishing but unstimulating in character, free from fats, condiments, and excessive quantities of sugar, so as to relieve the liver as much as possible in cases in which that organ is chiefly involved. The general regimen of the patient should be strictly in accordance with the rules of hygiene. If he has been accustomed to the use of stimulants or narcotics of any kind, these may be wholly discontinued. To produce absorption of the fluid, tight bandaging of the abdomen and the daily application of electricity afford the best results. An eminent physician recently reported a large number of cures from the application to the abdomen of dropsical patients of a strong faradic current. We have used the same remedy for a number of years with marked success. When the obstruction to breathing becomes so great as to greatly disturb the patient, and the accumulation of fluid is evidently increasing, tapping or aspiration may be resorted to as a means of withdrawing the fluid. The operation itself is a trivial one, attended by no danger whatever, but it has been observed that the patient generally undergoes emaciation much more rapidly after the operation than before, as the fluid is almost certain to return quite rapidly, thus robbing the blood of some of its most valuable constituents and so interfering with the nutrition of tissue. Tapping should not be delayed when other measures are not speedily successful. In cases of tumor, a surgical operation is required. Obstinate cases should be referred to a physician. In most cases, by means of the measures indicated, a return of the dropsy may be either delayed or wholly prevented, although a radical cure is seldom secured by this means.

CONSUMPTION OF THE BOWELS—MESENTERIC CONSUMPTION.

SYMPTOMS. *— Pain in the bowels, more or less constant, sometimes severe, causing the patient to draw up his limbs toward the abdomen to relieve the tension ; irregular action of the bowels ; alternation of constipation and diarrhea ; when the bowels are loose, stools very offensive, abdomen swollen ; loss of strength ; deep red color of the lips ; small ulcers about the mouth ; fissures in the lips.*

Consumption of the bowels is by no means so common a disease as is generally supposed, being almost wholly confined to children, adults be-

ing rarely affected, except when suffering with consumption of the lungs also. It is a somewhat obscure disease, and hence has been seized upon by quacks as a means of frightening patients so as to obtain an influence over them. We have had under our care many patients who had previously consulted physicians whose hobby seemed to be consumption of the bowels, and have found in nearly every case that the diagnosis had been "consumption of the bowels" either already present or threatening. In not one case, however, of those referred to, have we found any symptom of this disease. Chronic intestinal catarrh and scrofulous degeneration of the glands of the intestine, are quite likely to be mistaken for mesenteric consumption, and it is undoubtedly the frequency of these diseases which has given rise to the supposed frequency of abdominal consumption.

Treatment.—As in consumption of the lungs, the first attention should be given to the prevention of this disease, which, when well established, is by no means easy of cure. The preventive measures are essentially the same as those mentioned elsewhere for the prevention of consumption, and hence need not be fully recapitulated. They may be briefly enumerated as being an abundance of out-of-door exercise, exposure to sunlight, constant supply of pure fresh air, frequent bathing to secure activity of the skin, proper clothing, protection from colds, and a generous but unstimulating diet. In the case of children, care should be taken to secure milk from healthy cows. A mother suffering with the symptoms of consumption of the bowels should not nurse her child, as she will be very likely to communicate to it the germs of the disease. It should also be borne in mind that cows not infrequently suffer from tuberculosis, and communicate the disease in this way. As consumption is a contagious disease, it is evidently unwise to allow small children to be closely associated with persons suffering from any form of tuberculous affection. Great attention should be paid to the regulation of the diet, the patient being supplied with an abundance of nourishing, simple, and unstimulating food. As the disease is often attended by weakness of the stomach and various disorders of digestion, it is important to give these points prompt and careful attention. The general treatment should be the same as has already been given for chronic catarrh of the bowels and general scrofulous disease. The abdominal pain may usually be relieved by the use of fomentations and the wet abdominal bandage. The bandage should be wrung as dry as possible and covered with a dry woolen cloth. Great care should be taken to keep the extremities warm,

the feet of the patient becoming chilled very quickly especially after bathing. In cases in which there is considerable emaciation and dryness of the skin, an inunction with vaseline, olive-oil, or any other good unguent, is a very efficient and often essential measure of treatment. We have employed various unguents for this purpose, and have been best satisfied with the results obtained from the use of refined Chinese cocoa-nut oil imported from Canton.

DYSPEPSIA.

SYMPTOMS.—Uneasiness at the stomach; flatulence; acidity; heartburn; water-brash; gurgling; nausea; vomiting; regurgitation; gripes; colic; weight; pain at stomach; tenderness at pit of stomach; biliousness; coated and fissured tongue; sore mouth; throat ail; sour or other bad taste in the mouth; constipation; diarrhea; unnatural appearance of the feces; sediment in the urine; dry skin; night sweats; nervousness; headache; sick-headache; cold hands and feet; congestion of the head; pain between shoulders or under shoulder-blade; vertigo; disturbances of vision and hearing; drowsiness; sleeplessness; confusion of mind, and even more serious mental disorders.

Dyspepsia may be classified, first, as acute and chronic. One of the most important differences between an acute and a chronic case of indigestion is that acute dyspepsia will cure itself in time, usually in a very short period, by the unaided efforts of nature; while a chronic case of the disease continues from bad to worse, or without material improvement, indefinitely.

Chronic dyspepsia is generally much less active in its symptoms than is the acute form of the disease. It usually begins slowly, insidiously making its advances, and thus for a long time eluding observation, in many instances until well established. This is one reason why the diagnosis of the disease is often very obscure. Very frequently it is overlooked for years, being mistaken for some other disease through the special prominence of certain symptoms, which, as before intimated, may simulate almost any disease.

Basing the classification of chronic dyspepsia upon the most prominent symptoms observed in different cases of the disease, by far the greater part of the number may be included in the following five classes; viz., simple or slow, acid, foul or bilious, painful, and nervous dyspepsia. Each of the classes named has its characteristic symptoms, though any given case may combine the symptoms of one or each of the different classes.

Causes.—Before mentioning in detail the various causes which may be considered most active in occasioning disorders of digestion, it is important that we call attention to a general principle which applies to all cases of functional disease of the organs of digestion. In the study of digestion in health it is found that the two essential things are secretion and muscular action. So we find, correspondingly, that the two primary morbid conditions are defective secretion and disordered muscular action. The defect in the digestive secretions may be either in quantity or in quality, or may be both combined. The disordered muscular action may be either increased or diminished muscular activity; in the great majority of cases it is the latter condition. The special causes which will be mentioned are more or less active as agents productive of dyspepsia, just in proportion as they disturb these two essential functions of digestion, secretion and muscular action.

Errors in Diet.—There is no room to doubt that errors in diet, in manner of eating, in quantity or quality of food, are by far the most active causes of indigestion in this country, as well as in most others. Among the most prominent of dietetic errors may be mentioned the following: Hasty eating; drinking at meals; hot drinks; cold drinks, ices, etc.; use of cold food; eating too frequently; eating between meals; irregularity of meals; eating when weary; violent exercise just after eating; sleeping soon after eating; late suppers; hot or cold bathing shortly before or soon after eating; overeating; eating too little; unseasonable diet, as the use of highly carbonaceous and heating foods in summer, as fat meats, lard, butter, and excessive quantities of fats at any time; badly cooked food; fried food; pastry; poor bread; fat meats; "rich food"; too free use of sugar and sweet foods; soft food; too many varieties at a meal; condiments, as mustard, pepper, pepper-sauce, cinnamon, vinegar, excess of salt, etc.; pickles; preserves; tea and coffee; alcohol; tobacco; hard water; alkalies, as in the use of baking-powders, soda, saleratus, ammonia, etc.; decayed food; adulterations exposing the stomach, as well as the whole system, to the deleterious action of lead, zinc, arsenic, copper, sulphuric acid, etc., etc.; use of indigestible substances, as of clay, chalk, slate, and sundry other substances equally innutritious and indigestible in character.

Among causes not related to food or diet may be mentioned, pressure upon the stomach; mental worry, care, and anxiety; mental im-

pressions; drugs; sexual abuses; disease of other organs; worms; inherited dyspepsia; electrical and other meteorological changes, and numerous other influences which are as yet but imperfectly understood.

General Treatment.—As dyspepsia is not usually a fatal disease, thousands of people allow themselves to suffer from its pains and inconveniences for years without making serious efforts to recover. If anything is done, it is most likely to be a trial of some quack nostrum advertised on the fence or heralded in the daily newspaper as a "sure cure" for indigestion, its merits certified by a long list of fictitious or purchased testimonials. Every effort of this sort, of course, makes the disease worse in the end, even though there may be apparent temporary relief. Failing in several attempts, perhaps, the sufferer settles down in despair to the melancholy conclusion that he must remain as he is, that his malady is incurable; and so he lives along in a wretched way until consumption, that dread disease which often follows close on the heels of the hydra-headed malady we are considering, claims him as a victim and ends his misery.

The importance of giving to the treatment of this disease most serious attention is further seen by the fact that many organic affections which, when once well established, are impossible to cure, have their origin, in many cases, in indigestion. This is undoubtedly true of tuberculous degeneration of the lungs and other parts, together with other degenerative changes. The same may also be said of various nervous affections. This accounts, in part at least, for the almost constant association of impaired digestion with consumption, and with various organic affections of the liver, kidneys, and other organs. In most of these cases, the best, and often the only hope for a cure, lies in the treatment and cure of the digestive disorder; and, without doubt, if this could be accomplished sufficiently early, many cases of hopeless organic disease of the lungs and other organs might be prevented altogether. Although each variety of this disease, and indeed each individual case, requires a special plan of treatment in some respects different from what is required by any other variety or case, there are certain measures which are equally applicable to nearly all classes and cases of this disease. To these we will now call attention.

Removal of Causes.—If the dyspeptic would recover, he must seek carefully for each one of the causes of his disease, and carefully remove them. It is of no use to hope for recovery without doing this. If the cause is in the manner of eating, let him take care to eat prop-

erly. If he has erred in eating too much, or in eating improper articles of food, let him make a thorough reform in this regard. If the difficulty has been in overwork, too much anxiety, too little time to digest, or too sedentary habits, he must get away from his care, his business, his writing-desk, and seek health in out-of-door exercise, coupled with happy, cheerful associations. The careworn, burdened mother must have relief from the tedium of her routine life. A journey, a visit to a friend, or some other means of diversion, must be adopted. Whatever the cause has been, it must be removed. The woman who has been accustomed to wearing the conventional dress must make a thoroughgoing reform. So long as the waist is compressed so that the stomach is crowded down out of position, the organ cannot possibly perform its functions in a normal way. The reform in the mode of dress must be so thorough that the waist shall not only be no longer compressed, but allow room for growth, and such exercises must be adopted as will develop the abdominal muscles and expand the waist. The writer has frequently been able to raise the stomach two or three inches in the course of a few months' treatment and training.

If the stomach and bowels have been depressed in consequence of a stooped position in sitting or the habitual use of the rocking-chair, the attitude in sitting and standing must be corrected. Swedish movements and massage are especially indicated in these cases.

Hygienic Remedies.—In the treatment of this disease, attention to hygiene and the application of what are by some termed "hygienic remedies," are of first importance. Indeed, it is by these agents that nature is aided in her restorative work more than by any others, and upon these the most skillful and successful of those who have given great attention to the treatment of the functional diseases of the stomach find it safest to rely. Undoubtedly there are cases and circumstances which may be benefited, and the work of cure hastened, by the employment of medical agents; nevertheless we feel quite confident that the abuse of drugs is so very great, and has been the direct cause of so many bad cases of confirmed dyspepsia, that it would be far better to do without them altogether than to use them as they are not infrequently employed. An eminent writer on this subject, in referring to the treatment of dyspepsia says, "My main object in the treatment is to prevent the sufferers from resorting to drugs, which, in such cases, not only produce their own morbid conditions, but also confirm those already existing."

The extensive and often habitual use of alkalies for acidity, of purgatives for constipation, nervines and opiates for sleeplessness, and after-dinner pills to goad into action the lagging stomach, has been a potent factor in the production of a large class of most inveterate dyspepsias. This kind of treatment for dyspepsia cannot be too much deplored, nor too often discouraged. Especially to be discountenanced is the wholesale employment of "liver pills," "stomach tonics," "anti-bilious pills," "bitters," and the whole genus of quack nostrums and proprietary drugs.

Diet.—In the treatment of this disease, proper diet and regimen are of first importance. The diet is of special importance. It is necessary, however, that it should be most carefully adapted to the wants of each individual case, as nothing could be more true than the adage that "what is one man's meat is another's poison" when referring to cases of dyspepsia. The common plan of recommending some special dietary to all dyspeptics indiscriminately is a most pernicious one. We hear much of the grape cure, the beef cure, the fat cure, the cod-liver-oil cure, the milk, and sundry other special diet cures, of dyspepsia. No means is more useful in the treatment of chronic dyspepsia than a reliable guide for the preparation of food. We know of no work so valuable and thoroughly reliable for this purpose, as "Science in the Kitchen," by Mrs. E. E. Kellogg, A. M., Modern Medicine Publishing Company, Battle Creek, Mich.

It is not an easy matter to induce individuals suffering with dyspepsia to deny the demands of appetite. In many cases, the will is weakened by long-continued disease, and the appetite is perverted, so that the patient loses self-control, and thus himself stands as the most difficult obstacle in the way of his recovery. It must be insisted, however, that the directions to be given shall be followed implicitly. In no other way can a bad dyspeptic hope for recovery. All but one or two requirements may be conformed to, but the failure in one particular may be sufficient to make all other efforts useless.

Although, as before remarked, there is no such thing as a universal diet for dyspeptics, there are certain articles of diet that must be discarded by all persons who have a weak digestion, and certain dietetic rules which must be conformed to by all. To the most important of these we will now call attention.

1. Eat slowly, masticating the food very thoroughly, even more so, if possible, than is required in health. The more time the food spends in the mouth, the less it will spend in the stomach.

2. Avoid drinking at meals; at most, take a few sips of warm drink at the close of the meal, if the food is very dry in character.

3. In general, dyspeptic stomachs manage dry food better than that containing much fluid.

4. Eat neither very hot nor cold food. The best temperature is about that of the body. Avoid exposure to cold after eating.

5. Be careful to avoid excess in eating. Eat no more than the wants of the system require. Sometimes less than is really needed must be taken when digestion is very weak. Strength depends not on what is eaten, but on what is digested.

6. Never take violent exercise of any sort, either mental or physical, either just before or just after a meal. It is not good to sleep immediately after eating, nor within four hours of a meal.

7. Never eat more than three times a day, and make the last meal very light. For many dyspeptics, two meals are better than more.

8. Never eat a morsel of any sort between meals.

9. Never eat when very tired, whether exhausted from mental or physical labor.

10. Never eat when the mind is worried or the temper ruffled, if possible to avoid doing so.

11. Eat only food that is easy of digestion, avoiding complicated and indigestible dishes, and taking but one to three kinds at a meal.

12. Most persons will be benefited by the use of oatmeal, wheat meal, or graham flour, cracked wheat, and other whole-grain preparations, though many will find it necessary to avoid vegetables, especially when fruits or meats are taken.

On pages 372, 373, 927, may be found tables showing the length of time required for the digestion of various foods, the quantity necessary for health, suggestions for the proper combination of foods, the most easily digestible articles, etc. They will be found of great value in the treatment of this disease if carefully studied. We would in addition offer the following as practical suggestions:—

1. The flesh of wild game is usually more easy of digestion than that of domestic animals, and is less likely to be diseased.

2. Fats are injurious to dyspeptics almost without exception. If eaten at all, sterilized butter is the best form, and this should never be eaten cooked, but cold, on bread.

3. Broiling is the best mode of cooking meat.

4. "High" meat should never be eaten, as it has begun to decay.

5. Meat and vegetables do not agree well together.

6. Fruit and vegetables often disagree. Some cases must be required to discard vegetables altogether.

7. Milk does not agree well with either vegetables or fruits.

8. Milk is easier of digestion when boiled than in its natural state.

9. Warm food is easier of digestion than cold, with the exception of fermented bread, which should be eaten stale.

10. Cold meat and meat that has been "warmed over" are not easy of digestion.

11. Milk does not agree well with patients suffering from dilatation of the stomach, a class which includes a large proportion of dyspeptics. Buttermilk and kumyzoon (see Appendix) are useful.

TABLE

SHOWING THE LENGTH OF TIME REQUIRED FOR THE DIGESTION OF VARIOUS ARTICLES OF FOOD IN THE STOMACH, ACCORDING TO THE OBSERVATIONS OF DR. BEAUMONT ON THE STOMACH OF ALEXIS ST. MARTIN.

	H.	MIN.
Rice, boiled,	1	00
Sago, boiled,	1	45
Tapioca, boiled,	2	00
Barley, boiled,	2	00
Milk, boiled,	2	00
Milk, raw,	2	15
Vension steak, broiled,	1	35
Turkey, domestic, roasted,	2	30
Turkey, domestic, boiled,	2	25
Goose, roasted,	2	30
Lamb, fresh, broiled,	2	30
Eggs, fresh, hard boiled,	3	30
Eggs, fresh, soft boiled,	3	00
Eggs, fresh, fried,	3	30
[illegible], fresh, raw,	2	00
[illegible], fresh, whipped,	1	30
Custard, baked,	2	45
Codfish, cured, dry, boiled,	2	00
Trout, salmon, fresh, boiled,	1	30
Bass, striped, fresh, broiled,	3	00
Salmon, salted, boiled,	4	00
Oysters, fresh, raw,	2	55
Oysters, fresh, roasted,	3	15
Oysters, fresh, stewed,	3	30
Beef, fresh, lean, rare, roasted,	3	00
Beef, fresh, dry, roasted,	3	30
Beef, steak, broiled,	3	00
Beef, with salt only, boiled,	2	45
Beef, with mustard, etc., boiled,	3	30
Beef, fresh, lean, fried,	4	00
Beef, old, hard, salted, boiled,	4	15
Pork-steak, broiled,	3	15
Pork, fat and lean, roasted,	5	15
Pork, recently salted, fried,	4	15
Mutton, fresh, roasted,	3	15
Mutton, fresh, broiled,	3	00
Mutton, fresh, boiled,	3	00
Veal, fresh, broiled,	4	00
Veal, fresh, fried,	4	30
Fowls, domestic, boiled,	4	00
Fowls, domestic, roasted,	4	00
Ducks, domestic, roasted,	4	00
Duck, wild, roasted,	4	30
Butter, melted,	3	30
Cheese, old, strong, raw,	3	30
Soup, marrow bones, boiled,	4	15
Soup, beans, boiled,	3	00
Soup, barley, boiled,	1	30
Soup, mutton, boiled,	3	30
Green corn and beans, boiled,	3	45
Chicken soup, boiled,	3	00
Oyster soup, boiled,	3	30
Hash, meat and vegetables, warmed,	2	30
Beans, pod, boiled,	2	30
Bread, wheaten, fresh, baked,	3	30
Bread, corn, baked,	3	15
Cake, corn, baked,	3	00
Dumpling, apple, boiled,	3	00
Apples, sour and hard, raw,	2	50
Apples, sour and mellow, raw,	2	00
Apples, sweet and mellow, raw,	1	30
Parsnips, boiled,	2	30
Carrot, orange, boiled,	3	15
Beet, boiled,	3	45
Turnips, flat, boiled,	3	30
Potatoes, Irish, boiled,	3	30
Potatoes, Irish, baked,	3	30
Cabbage, head, raw,	2	30
Cabbage, head, boiled,	4	30

Exercise.—This is of first importance as a general renovator of vital action. The secretion of gastric juice is, under ordinary circumstances, proportionate to the amount of nourishment which the system is prepared to assimilate. Exercise creates a demand for food, and so stimulates both assimilation and secretion. The best forms of exercise are those which will secure the most uniform activity of the several parts of the muscular system. Riding, walking, rowing, and especially horseback riding, are to be recommended as excellent. Gymnastic exercises and the judicious use of the "health lift" are also good; and for persons who from lack of time, or other cause, cannot adopt the other methods, these may be considered as almost indispensable. Such exercises as running, jumping, base-ball playing, "walking matches," and other violent exercises, cannot be recommended. Trapeze exercises must also be discountenanced on the same grounds. Agriculture, especially the raising of small fruits and the cultivation of flowers, cannot be too highly recommended as forms of exercise for dyspeptic patients. For that large class of sallow-skinned, weak-backed, dyspeptic young ladies who have been made dyspeptics by idleness and too much "coddling" by fond mothers, who sacrifice themselves to the monotonous drudgery of the cook-stove and the sewing-machine, and their daughters to sentimental idleness and fashionable piano-thrumming,—for the indigestion of these poor victims of mistaken maternal care, the varied exercise necessitated by domestic labor is a most admirable panacea. And for the gaunt, hollow-cheeked, sunken-eyed, slab-sided, cigar-worshiping young man whose chief occupation is cultivating a mustache, smoking cigarettes, and swinging a gold-headed cane, a little wholesome experience in earning a subsistence by the sweat of the brow, instead of leaning upon rich relatives, will prove a specific for "softening," which begins in the brain and extends to every part of the system.

Exercise before breakfast, while excellent for some, cannot be too much condemned for others. Persons who suffer with "goneness," "faintness," "sinking," and allied pains when the stomach is empty, and especially in the morning, must avoid exercise to any considerable extent before eating. Disregard of this rule occasions loss of appetite and weakening of digestion. Persons who are very weak must also avoid exercise before eating in the morning.

As before remarked, only gentle exercise can be taken soon after eating, or immediately before, without injury. Persons who feel a con-

stant "sinking" or weakness in the stomach and bowels will derive benefit from wearing about the body a broad band of flannel.

Rest and Sleep.—It is of great importance that sufficient sleep be obtained, though sometimes this seems impossible on account of the nervousness occasioned by this disease. It is generally best to retire early, but there is no virtue in getting up in the morning at an early hour unless the body is recuperated by rest. Sleep must be obtained, and on many accounts it is better to take it in the fore part of the night; but if not secured then, it should be taken at other times. Sleeplessness induced by anxiety is often a cause of dyspepsia. It is a great obstacle in the way of successful treatment.

Some cases of dyspepsia require a large amount of rest, besides the hours allotted to sleep. We have had a number of cases in which we found absolute rest for an hour or two after each meal essential to induce good digestion. Some cases require the maintenance of the recumbent posture at least three-fourths of the time. In such cases the amount of exercise essential to good assimilation must be secured by means of passive exercise, as massage, or Swedish movements.

Traveling.—Many physicians are in the habit of recommending patients upon whom they have exhausted their skill, to seek health by traveling. Thousands annually leave their homes and at great expense visit various watering-places, mineral springs, etc., in this country and Europe, in consequence of this advice. Some return much benefited; the majority are no better except from rest. This is due to the fact that traveling does not remove the real cause of the difficulty, and may often increase it. In general, while traveling it is next to impossible to secure either regularity of diet or other habits, or a proper quality of food. This, of course, in a great degree counteracts the benefit to be derived from gentle exercise and freedom from care.

The advantage of special climates is undoubtedly overrated in a very great degree, though a cool climate may generally be considered as best, especially for those suffering with "bilious dyspepsia." With nervous dyspeptics, a warm climate seems to agree better, as it occasions less disturbance of the circulation.

Mental and Moral Treatment.—This is too important a part of a successful plan of treatment to be neglected. The gloomy despondency must be steadily combated by a determination to be cheerful. The disposition to fret and worry, and to dwell upon the unpleasant or painful

features of the disease, must be fought against with firmness and resolution. The dyspeptic who allows his mind to constantly dwell upon his stomach, and who speculates upon the probabilities respecting the digestion of each morsel of food as he swallows it, will be certain to remain a dyspeptic. This unfortunate tendency on the part of dyspeptics is a great impediment to recovery in many cases. The mind must be diverted from self as much as possible at all times, and especially while eating. The habit many dyspeptics have of talking constantly about themselves, sometimes amounting almost to a monomania, cannot be too strongly condemned. Too great solicitude about the stomach, diet, etc., is worse than none at all.

Dress.—In addition to wearing the clothing loose, so as to give every organ perfect freedom of action, it is of greatest importance that the extremities be kept thoroughly warm. Cold hands and feet are very common with dyspeptics. It will generally be found necessary to wear flannel under-garments throughout the year, graduating the thickness to the temperature. It will sometimes be necessary to change the clothing once or twice a day to accomplish this in extreme cases of disturbed circulation. Great pains must be taken to keep the extremities warm.

General Measures of Treatment.—The general indications for treatment are, 1. To increase the general vigor of the system by tonic remedies; 2. To balance the circulation; 3. To increase the demand for food, and thereby improve the quantity and quality of the digestive juices. This can be best accomplished by the following means in addition to the measures already mentioned:—

Baths.—The cool morning bath is one of the most effective measures for increasing the general vital tone and resistance. A person who has not been accustomed to cool bathing should begin with water of a moderate temperature, say 85° to 90°, gradually lowering the temperature from day to day as the ability to react increases. At first the whole surface of the body should not be wet at once. One part, as an arm or a leg, should be rubbed with the moistened hand or a wet sponge, and then immediately dried and rubbed, then another part in the same manner until the whole surface of the body has been gone over. After a time the cool shower or spray may be employed with advantage. The practice of taking a cool bath every morning is of great value in most cases.

A short warm, sweating bath—hot-air, vapor, or hot-water bath—once or twice a week, is beneficial.

Sea bathing, so much lauded, is often overdone. If the patient is chilled in taking the bath, it is decidedly harmful.

The vigorous rubbing and manipulation of the skin and muscles which properly follow the baths referred to, are as beneficial as the baths themselves, and are especially needful to secure a good reaction.

Inunction.—To encourage the surface circulation, the oil bath, or inunction, is a most admirable remedy. It is especially serviceable in cases in which there is dryness of the skin.

Abdominal Support.— In quite a large proportion of dyspeptics — perhaps one half; even a larger proportion among women — there is more or less displacement of the stomach or other of the abdominal organs. The strain upon the abdominal sympathetic nerve resulting from this displacement is one of the chief sources of a large share of the nervous symptoms from which sufferers of this class complain. A prolapsed or dilated stomach, being unable to empty itself properly, retains the food too long, so it undergoes fermentation and other changes. The mucous membrane is irritated by the too long continued contact with the food and gastric juice, and chronic irritation, often ulceration, and catarrh are the result. The application of a properly adjusted abdominal bandage by lifting these prolapsed organs into position, removes the strain and aids the stomach in getting rid of its contents, and is thus an efficient curative means. An abdominal supporter may be properly applied for a few months in a large proportion of cases of chronic dyspepsia. In some cases the supporter must be worn habitually.

Swedish Gymnastics.— In all cases the wearing of the abdominal supporter should be supplemented by exercises specially adapted to the development of the abdominal muscles. Breathing exercises are also of great value in aiding absorption and stimulating the movements of the stomach. The exercises shown in Fig. 232–236 and 240, 241 are very helpful.

Many other movements may be advantageously used, also abdominal massage. For further directions upon these subjects the reader is referred to "The Art of Massage," by the author, and "Swedish Movements, or Medical Gymnastics," published by the Modern Medicine Publishing Company, Battle Creek, Mich.

Special Measures of Treatment.—The special indications to be met by treatment in dyspepsia are, 1. To increase the quantity and quality of the gastric juice, and of the other digestive fluids: 2. To

increase the muscular activity of the stomach and bowels; 3. To allay irritation and decrease the secretion of gastric juice; 4. To promote absorption; 5. To palliate the various other symptoms.

To Increase the Secretion of Gastric Juice.—Any measure which will improve the tone of the stomach will accomplish this result. We may mention, as useful for this purpose,—

1. Taking a few sips of cold or hot water just before or just after eating. A larger quantity may be taken half an hour before a meal with good effect. A few sips of hot drink taken an hour after eating is a very useful measure in slow digestion.

2. The application of a hot-water bag to the pit of the stomach stimulates the activity of the gastric glands. Alternate hot and cold applications made to the portion of the spine just back of the stomach has a similar effect, and often in a remarkable degree.

3. The application of fomentations night and morning, and wearing a moist abdominal compress through the night, or for a few hours after each meal, are measures of very great utility.

Measures to Increase Muscular Action.—The measures just described are equally useful in exciting muscular activity. In addition may be mentioned gentle manipulation of the bowels, or kneading of the abdomen daily, or after each meal.

If the patient is able, he should himself make a practice of kneading and percussing the abdomen for fifteen or twenty minutes night and morning.

To Decrease the Secretion of Gastric Juice and Allay Irritation.—Excessive secretion of gastric juice is present in hyperpepsia, a condition which nearly always precedes ulceration of the stomach, and has been shown by the researches of Ewald, the writer, and others to be present much more frequently than is generally supposed. The cause of the excessive secretion of the gastric juice is irritation of the sympathetic ganglia which control the glands of the stomach. This condition is usually accompanied by tenderness at the pit of the stomach — an evidence of local irritation. There is quite likely, also, to be pain or tenderness in the spine opposite, or between the shoulders. The most effective measures for relieving this irritation are the following: —

1. Regulation of the diet, excluding coarse foods, condiments, pickles, fats, meats, and all unwholesome and irritating substances. Special pains should be taken to masticate the food very thoroughly.

On this account dry food should be taken so as to secure a large admixture of saliva, which serves to neutralize an excess of acid.

2. The moist abdominal bandage, the hot and cold trunk pack,—a bag filled with hot water, placed over the stomach, the cold bandage being at the same time applied about the body and over the bag.

3. Subcarbonate of bismuth in 20 to 30 grain doses before meals.

In cases in which an extreme degree of irritation and excessive secretion of the gastric juice exist, it is sometimes necessary to administer bicarbonate of soda in doses of 10 to 20 grains either before or just after eating, or in mild cases three hours afterward.

Flatulence.—Stomach flatulence, occasioned by the formation of carbonic acid gas, may usually be relieved by swallowing a small quantity of quite hot water and applying hot fomentations to the stomach with gentle kneading. A little camphor, peppermint, or winter-green added to the hot water increases its efficiency.

Acidity.—One of the best remedies for acidity, and one which is likely to do no harm while it does much good, is pulverized charcoal. It may be taken in powder, in doses of a half teaspoonful, with water, but the dry powder, taken in tablets, is better. The sovereign remedy for acidity is hot-water drinking. Two or three glasses should be taken as hot as can be sipped, one hour before each meal and half an hour before going to bed. The effect of the hot water is to wash out the stomach, and so remove any fermenting remains of the previous meal, and to stimulate the muscular and secreting activities of the stomach. Heartburn may be treated as directed for acidity.

In cases of acidity, the same remedies are to be recommended as for flatulence, this symptom being due to the same causes. Make the diet consist largely of food which requires thorough mastication,—a most effective means of preventing fermentation. On this account, zwieback and granose (see Appendix) are especially to be recommended, as well as other hard foods which require mastication; also charcoal tablets.

Vomiting.—When present, this symptom is sometimes very troublesome. If there is evidence from other symptoms that there is something in the stomach which needs to be expelled, the efforts of nature should be encouraged by copious draughts of tepid or milk-warm water, which will lessen the painful retching, as well as secure thorough emptying of the stomach. When the matters vomited give no evidence of sourness or decomposition, and the symptom is evi-

dently due to nervous conditions or to an irritable state of the stomach, a few sips of hot water will usually afford relief, especially if coupled with a hot fomentation over the stomach. In cases which are not thus relieved, ice pills, or small sips of iced water, with cold to the stomach and warm to the spine, will almost always succeed. In bilious vomiting, when the matters vomited are of a green color, mild acids, as lemon or lime juice, will be found excellent, sometimes giving almost instant relief. In these cases, the stomach is infected with germs. The most effective of all means of treatment is lavage, or washing of the stomach, which often effects an immediate cure, though sometimes it is necessary to repeat the washing if the case is an obstinate one. The withholding of food and drink for one or two days, is also necessary in very obstinate cases. Apply electricity over the stomach and spine for nausea without vomiting.

Constipation.—Inactivity of the bowels is often one of the most troublesome difficulties with which the dyspeptic has to contend. Two of its most potent causes we have not before mentioned, but call attention to them here as they have an important bearing on treatment; viz., the use of purgatives, and carelessness respecting the observance of the calls of nature. The latter cause is especially common with women, particularly those who reside in the country, where accommodations for the purpose are by no means so convenient as in the larger cities, where indoor conveniences are almost universal. With most people, the bowels naturally move in the morning, before or just after breakfast. If the duty is neglected when it should be performed, the bowels become in some degree tolerant of their contents, so that the call is less vigorous; and the neglected organs may become so dormant that they may cease to demand relief. The most obstinate cases of constipation are produced in this way.

The proper measures for the relief of constipation have already been given elsewhere. See pages 912 and 913.

Other symptoms which are present in dyspepsia in common with other diseases of the digestive organs, as pain, hiccough, foul breath, unnatural appetite, etc., are considered in the section devoted to symptoms at the close of the section on the diseases of the digestive organs. Symptoms dependent upon derangement of the nervous system, the circulation, etc., are dwelt upon in their proper connections.

ACUTE DYSPEPSIA.

SYMPTOMS.—Weight, fullness, or pain at the pit of the stomach; nausea and perhaps vomiting, or diarrhea; usually more or less fever; pain in the head; prostration; coated tongue; unpleasant taste in the mouth; generally little or no appetite.

Acute dyspepsia, when accompanied by considerable fever, is often termed "gastric fever," an incorrect term, however, as the fever is only a symptom of the local disease. In severe cases there is an actual catarrh of the stomach, an affection which has been already described.

Causes.—Most cases of acute dyspepsia are the result of excess in eating, taking food at an unseasonable hour, or partaking of very unwholesome and indigestible substances, or the accidental ingestion of some highly irritating substance, as poisoned or decayed food, or some similar irritant.

Treatment.—The most that is needed in the majority of cases is abstinence from food for twenty-four hours, and the use of only the most simple foods, as boiled rice, oatmeal gruel well boiled, and similar food, for two or three days afterward. Animal food should be abstained from altogether, as the stomach is unprepared to digest such food. In addition to regulation of the diet, the patient may be benefited by some simple measures of treatment. When there is nausea, give copious draughts of warm water to encourage vomiting, or better, when possible to do so, employ the stomach-tube (page 898). When the stomach is emptied of solid matter and the vomited matters become wholly fluid and assume a yellow or green color, due to the presence of bile, the vomiting should be checked by the use of ice or iced water, which the patient should be allowed to swallow in small quantities. Sometimes ice applied over the stomach externally secures prompt relief, but generally hot fomentations secure the best results. The hot applications should be made thoroughly, as hot as the patient can well bear, and frequently renewed. If they give relief, they should be continued several hours, the stomach being constantly covered with a warm, moist flannel compress. It is also well to give a large, warm water enema. If there is pain in the bowels, the water employed for the enema should be as hot as can be borne comfortably, and the enema should be as large as the patient can retain, for which reason it should be administered slowly, with the patient lying upon his back.

The use of purgatives for the relief of acute dyspepsia, especially

the employment of some preparation of mercury is much to be deprecated. A mild saline laxative (Appendix, page 1597) may sometimes be used with advantage. Soda is also occasionally useful, but the most effective means is lavage (page 898). It may be necessary to repeat the lavage several times and for several days. The use of a sterilized food like granose is highly advantageous.

SIMPLE DYSPEPSIA, OR SLOW DIGESTION.

***SYMPTOMS.**—Sensation of having eaten too much, when only a small amount has been taken; weight and oppression an hour or two after eating; appetite fair, though patient often does not care for food until he begins to eat; flatulence of stomach, with tasteless and odorless eructations; often pain between shoulders or beneath shoulder-blade; in some cases pain in region of heart; palpitation, often occurring in the night; disturbed and unrefreshing sleep; tongue foul in morning and bad taste in mouth; bowels usually constipated; unnatural sleepiness, especially after meals; lack of energy; symptoms all aggravated by a hearty meal.*

This affection is often the cause of what is mistaken, even by physicians, for softening of the brain. It may also be mistaken for heart disease, great alarm being not infrequently created by the occurrence of severe palpitation in the night, suddenly awakening the patient from sleep with an impression of impending death. Slow digestion is the most common of all forms of dyspepsia, and many people suffer from it without understanding the real nature of their disease.

Causes.—The disease may be caused by any of the numerous causes of dyspepsia which have been enumerated. It is more common in men than in women, and especially affects sedentary persons and those nervous individuals who eat rapidly, swallowing their food without proper mastication. It is also common in persons whose teeth are defective. Its immediate cause is deficient activity of the muscular walls of the stomach and intestines, and also deficient quantity or quality of gastric juice.

Treatment.—Slow digestion is benefited by the two-meal plan of eating, as by this means the stomach is given more time for its work. Six or seven hours should intervene between the meals. The more closely the patient confines himself to the articles included in the table of foods easy of digestion, given on page 736, the better progress he will make. The special measures of treatment useful are those described as useful to increase the secretion of gastric juice and muscular action in the stomach and bowels.

ACID DYSPEPSIA.

SYMPTOMS.—Same as in simple dyspepsia, exaggerated; particularly heartburn; regurgitation of very sour liquid from the stomach; sour eructations; tongue coated white, usually fissured transversely, flabby, and showing marks of teeth at the edges; sour taste in mouth, causing rapid decay of the teeth; grinding of teeth at night; bowels loose or constipated; reddish sediment in urine; usually pain at pit of stomach, and soreness on pressure.

Patients suffering with this form of dyspepsia are usually very thin and bloodless. Occasionally, however, we meet a case of the opposite kind, in which there is an abundance of tissue, though of a loose, flabby texture. Starchy food, sugar, fruits, and especially vegetables of all kinds, cause great increase of acidity and heart-burn. In some cases, even bread and all sorts of preparations from grains will disagree. Sugar, or any food containing it, will give rise to great distress. A meal consisting of animal food almost entirely, may be digested without difficulty, though milk frequently sours.

Causes.—Same as those of slow digestion, with which it usually begins. The digestion being very slow, portions of fermenting food remain in the stomach from one meal to another, so that acidity becomes habitual. Women usually suffer from acidity more than men.

Treatment.—Acid dyspepsia is aggravated by the use of starchy foods and those containing sugar. Vegetables must be discarded for a time. Sugar and all articles containing it must be wholly discarded. The idea many people have that sugar neutralizes acids, is quite a mistake. The grains can be taken better than starchy vegetables, such as potatoes. Often fermented bread cannot be eaten without distress. Aerated bread, or light unleavened bread in the form of rolls, crisps, or crackers,* is much preferable. Twice-baked bread, or zwieback, granose, and such other dry foods as require thorough mastication are recommended. Avoid acid fruits. Employ lavage and other measures as for simple dyspepsia. Charcoal, preferably in the form of antiseptic tablets (see Appendix), is to be highly recommended.

BILIOUS OR FOUL DYSPEPSIA.

SYMPTOMS.—Those of slow digestion with occasional acute attacks in which there is loss of appetite; nausea and vomiting or regurgitation of bile; undefined distress or

---

*Recipes for this kind of bread and many other wholesome foods for dyspepsia will be found in a work by Mrs. E. E. Kellogg, A. M., entitled, "Science in the Kitchen," Modern Medicine Pub. Co., Battle Creek, Mich.

uneasiness at the stomach; soreness under lower border of ribs on right side; bowels sometimes constipated, often loose; bitter taste in mouth; tongue coated, usually creamy or yellowish color; fetid eructations; throbbing pain in forehead and temples, often described as "splitting;" pain in eyes; countenance sallow.

The term "bilious" is used to distinguish this form of indigestion, not because either the liver or the bile is the immediate cause of it, but because of the bilious vomiting and tawny appearance of the skin which usually occur in this class of cases. Acute dyspepsia of the same sort is termed "a bilious attack," or "sick-headache." Migraine, or nervous headache, is unquestionably due primarily to a foul condition of the stomach and resulting disturbance of the sympathetic nervous system, in the great majority of cases.

As in acid dyspepsia, this form of indigestion differs from slow digestion chiefly in the exaggeration of the morbid conditions present in that disease. Digestion being still slower than in acid dyspepsia, the characteristic symptoms occur more remote from the time of eating. The usual time for the appearance of the most marked symptoms is in the morning, before breakfast. Headache, great flatulence, a very foul tongue, a bitter taste in the mouth, with nausea and finally vomiting of undigested and partially decayed food in a very foul state, indicate the inactivity of the digestive organs present in this form of dyspepsia. When vomiting is continued, bile is generally expelled, the duodenum becoming affected and taking part in the expulsive action. Diarrhea often accompanies, and in some cases replaces, the vomiting.

Owing to this thorough clearing out of the stomach and bowels, these attacks do not occur at very brief intervals. They are often periodical, however, recurring sometimes as often as once or twice a week, and again not more often than once in two to four weeks.

Farinaceous foods give much less trouble than meats, especially fat meats. Vegetables eaten with fat, pastry, oily nuts, meat which has been kept too long, sometimes eggs, especially those not perfectly fresh, with albuminous and fatty foods generally, increase the symptoms peculiar to bilious dyspepsia, and bring on the attacks.

Causes.—This form of dyspepsia, like the preceding, grows out of slow digestion, a form of decomposition known as *butyric acid* fermentation taking place instead of the acetous fermentation present in acid dyspepsia. The most common exciting causes are the use in excess of sugar and sweet foods, fats, flesh food, tea and coffee, tobacco and alcoholic liquors. The attack is usually excited by overeating, eating

warm bread and butter, sweet foods, fried foods, rich pastry, and similar foods.

Treatment.—In this form of indigestion, the greatest simplicity in diet is necessary. Complicated dishes, stews, etc., must be wholly interdicted. **Pastry is practically synonymous with poison, for these patients. Fats, as butter, lard, meat, oysters, cheese, rich gravies, pastry, sweets, hasty eating, and drinking at meals must be avoided.**

Vegetables, being difficult of digestion, are very productive of gas, and hence should be for a time avoided by persons subject to bilious dyspepsia. Grains, as oatmeal, wheat meal, rice, and ripe fruits, are adapted to this class of cases. Meat should be taken sparingly, and in many cases can be advantageously discarded altogether for a time. The other treatment should be that recommended for acute dyspepsia at the time of the attacks, to be followed by the treatment suggested for slow digestion. In many cases, milk must be discarded. A most valuable remedy in cases of this sort is subcarbonate of bismuth, which may be taken in doses of twenty to thirty grains before each meal. For foods, see Aseptic Dietary (see Appendix, page 1627). The moist abdominal bandage worn at night is useful.

PAINFUL DYSPEPSIA.

SYMPTOMS.—Most characteristic is pain at the pit of the stomach, with tenderness on pressure just at the lower end of the sternum; also tenderness on right side under lower border of ribs; pain in stomach, described as "tearing," "burning," "gnawing," or "rasping," coming on soon after taking food, and ceasing when digestion is completed; when due to congestion of mucous membrane, all-gone feeling when stomach is empty, relieved by bland food; pulsation at pit of stomach or below.

Causes.—Painful dyspepsia may be developed from acid or bilious dyspepsia. It is most often the result of gastritis. Not infrequently the congestion to which this pain is sometimes due is caused by compression of the abdominal organs, obstructing free circulation. Hence, women who wear corsets are very liable to be affected by it, though they will rarely admit the cause, and still more rarely can be induced to remove it. It is also sometimes due to the pressure of some firm object against which the individual leans in his daily business; in this way various trades are productive of painful dyspepsia.

Treatment.—Meat and all coarse vegetables must be carefully avoided in this affection. Preparations from the grains, as farina, cornstarch, well-boiled oatmeal porridge, and other farinaceous substances, as

sago, tapioca, etc., agree best. It should be borne in mind, however, that in this class of cases such articles as cracked and crushed wheat, samp, graham bread, and other foods containing the coarser parts of the grain, are likely to do harm, the outside woody parts of the grain acting as a mechanical irritant to the sensitive mucous membrane of the stomach. It is this fact that has given the seeming occasion for a class of ignorant individuals who have mercenary ends to serve, to declaim so loudly against the use of whole-wheat flour. The fact that the coarser parts of the grain can be removed with advantage for this class of cases is no evidence against its utility in many other forms of indigestion.

In extremely bad cases, it is often necessary to put the patient on extremely simple diet. In cases of this sort, nothing generally answers the indications so well as milk. It should be taken fresh as possible, and should be given to the patient about as warm as can be taken with comfort, unless there is considerable fever, when it may be taken in small quantities iced. In extreme cases, the irritability may be so great that the food will be rejected if taken in any considerable quantities. In these cases, it becomes necessary to take the food, milk by preference, in very small quantities often repeated. If necessary, so small a quantity as one or two spoonfuls may be given once an hour at first, gradually increasing the quantity and the intervals, until the necessary quantity is taken at the usual intervals for meals. Then a little well-boiled and strained oatmeal or graham gruel may be added, the quantity being increased until the patient can bear semi-solid food. Many lives have been saved by this plan when death seemed imminent from inability to digest sufficient nourishment. In some cases we have found even milk intolerable, and have then secured the most successful results by the use of the white of egg beaten to a froth, and made palatable by the addition of a few drops of lemon juice or wine. In the worst cases we have even found the employment of nutritive enemata necessary for a short time until the irritability of the stomach subsided sufficiently to tolerate nourishment.

In many cases of this form of dyspepsia, the patient feels a terrible faintness as soon as the stomach is empty, which is in some degree relieved by taking proper food. This often leads the patient to resort to frequent eating when there is no requirement for so doing, and with great detriment. The difficulty referred to occurs particularly before breakfast; and the unpleasant sensations sometimes become so great that the appetite is destroyed. Since the faintness described is not real

hunger, it is not best to relieve it by taking food, but it may often be relieved by a little warm drink. A few sips of cold water will often relieve the difficulty. In many cases a cup of warm water or caramel-cereal (see Appendix), may be taken an hour before breakfast with advantage. Tea and coffee must be avoided.

Subnitrate of bismuth in twenty-grain doses may be used with advantage before each meal. Hyperpepsia is often present. This must be relieved by proper diet and appropriate treatment, as described elsewhere in this work.

Further treatment consists in the employment of hot fomentations over the stomach two or three times a day, and if necessary after each meal. Hot and cold applications to the spine, just opposite the stomach, are also a valuable means of relief. All measures calculated to improve the general health should be thoroughly employed.

NERVOUS DYSPEPSIA.

SYMPTOMS.—Frontal headache; pain described as pressure in the back part of the head; peculiar sensations at the top of the head; pain in the eye-balls; sometimes pain in the upper part of neck, or extending down the spine between the shoulders; pain in spine, back of stomach, or beneath shoulder-blades; neuralgia; palpitation of heart; cold extremities; general debility; confusion of thought; loss of memory; irritability; great nervousness; fidgets; morbid sensibility; melancholy; tendency to insanity; stomach cough; vertigo; blurring of vision; appearance of dark or bright spots, especially upon stooping; unnatural drowsiness, especially after meals; sleeplessness at night; languor in morning, feeling best in afternoon or evening; foul tongue.

The mutual sympathy between the stomach and the brain is very marked. Disease of the stomach may be produced by mental disorders, and various mental and nervous affections may arise from disease of the stomach. Cases sometimes occur in which the most prominent symptoms of dyspepsia manifest themselves through the nervous system, by which alone the disease may be made out. Such cases are included under this head. The stomach symptoms of indigestion are sometimes so very slight that they can hardly be distinguished; yet there is undoubtedly a serious fault in these cases in the elaboration of the food. The process of digestion is left incomplete, and the blood becomes full of crude, unelaborated material, which not only does not impart to the tissues new life and vigor, but is a direct source of irritation. The brain, being the most sensitive part of the nervous system, of course suffers most, and hence we have abundant cause for the mental depression, unbalanced mental action, confusion of ideas, vacil-

lation of judgment, perversity of disposition, and other kindred disturbances from which the nervous dyspetic suffers.

Many persons, finding themselves in this wretched state, and not realizing the influence of physical conditions upon the mind, fall into hopeless despair, even when no outbreaking sin or intentionally wrong act has been committed. At first, there will be observed simply an exaggeration of real difficulties or misfortunes; but after a time the individual settles into a state of gloom, despondency, and mental depression in which he will suffer with troubles that are purely imaginary. Of these hypochondriacal persons, Dr. Cullen gave a very graphic description which we quote as follows: —

"In certain persons there is a state of mind distinguished by the following circumstances: a languor, a listlessness, or want of resolution with reference to all undertakings; a disposition to seriousness, sadness, and timidity as to all future events; an apprehension of the worst or most unhappy state of them, and therefore, often upon slight grounds, an apprehension of great evil. Such persons are particularly attentive to the state of their own health, to every smallest change of feeling in their bodies; and from any unusual feeling, perhaps of the slightest kind, they apprehend great danger, and even death itself. In respect to all these feelings and apprehensions, there is commonly the most obstinate belief and persuasion."

Nervous dyspeptics often suffer much in mind from a morbid sensitiveness. They imagine themselves the subject of criticism or ridicule, become morose and irritable, and exceedingly unhappy. Occasionally they find themselves haunted with evil thoughts, with almost irresistible impulses to commit improper or criminal acts, as blasphemy, suicide, etc. They are almost always certain to imagine themselves the subjects of many different diseases, usually of some incurable malady.

It is observed that mental disorders of the character described are often the result of intestinal dyspepsia, a form of the disease in which the local symptoms are less prominent than are those which relate to the stomach, but equally grave.

Causes.— Observation of some hundreds of cases has convinced the writer of the correctness of the view of Bouchard, Glenard, and other eminent French physicians, that nervous dyspepsia is almost without exception directly due to a dilatation of the stomach and a consequent irritation of the sympathetic nerve, through which the whole nervous system is disturbed. In most, perhaps all, cases of nervous dyspepsia

there is a chronic state of poisoning due to absorption from the stomach of the products of germ action. Many of the nervous symptoms present in this disease are due to the effects of these poisons upon the system. The use of flesh food, tea, coffee, and alcoholic drinks, is a cause of this malady in many cases.

Treatment.—Nervous dyspeptics rarely complain of much difficulty with digestion, yet the most careful observance of strict dietetic rules is of great importance in this class of cases. The diet must be plain, unstimulating, but very nutritious. It is of special importance that the patient make a free use of the whole-grain preparations. Oatmeal is a specially good article of food, as are also graham and cracked wheat. Pepper, spice, mustard, and all other irritating condiments must be scrupulously avoided. A diet of fruits and grains is the most suitable for these cases.

Fomentations and the various other local applications for the relief of pain must be employed as necessary. In many cases fomentations over the stomach will be found very useful, though in some cases the nervousness will be aggravated by this application. Wearing the abdominal bandage is a very excellent means of increasing the activity of the stomach, and also of promoting sleep. Patients of this class usually need a great amount of rest, and judgment must be used in advising exercise. A change of occupation is essential in many cases, even after a cure has been effected, in order to prevent a relapse. We are certain, however, that a change of this kind is often advised when a change of diet is all that is required. We have not infrequently been consulted by literary persons who feared that their minds were becoming so seriously affected that they should be obliged to abandon their professions ; but with few exceptions we have been able to say to them that a careful regulation of the diet and regimen was all that was required, and have been gratified to see the result all that could be desired.

MIXED CASES.

It not infrequently happens that cases of dyspepsia exhibit the symptoms which belong to two or more classes of the disease. In cases of this sort it is of course necessary to conform to the special indications so far as can be done. The most frequent combination is acid and painful dyspepsia. These cases are often very troublesome to manage. None but a careful, discerning physician is competent to successfully pilot safely out of his doubly perplexing difficulties such a sufferer as this ; but sufficient

care, patience, perseverance, and well-directed effort will secure certain success.

An Important Caution.—It is of great importance to recollect that the special directions for the diet in different forms of dyspepsia which we have given are not always to be followed for an indefinite length of time. In many cases it is necessary to adhere strictly to the special dietary only for a few days, when the diet may by degrees be made to include a larger variety of foods. We would, however, impress upon the mind of the dyspeptic this fact; that when he finds himself well again, he must not make the error to suppose that the principle "once in grace always in grace" in any sense or in the smallest degree applies to the improved state of his digestion. Although the stomach may be restored to a sufficient degree of health and vigor to enable it to do its duty well *under favorable circumstances*, it will be certain to fail and relapse into a diseased state again as soon as those conditions are no longer supplied.

DEPRAVED APPETITE.

SYMPTOMS.—Unnatural craving for either wholesome or unwholesome foods and drinks; general decline in health, conditions varying according to the particular phase of the disease.

Polyphagia, or voracious eating, is a symptom which not infrequently accompanies diseases of the digestive organs. It is also frequently observed in various nervous diseases, as epilepsy and various mental disorders. In the form of gluttony it is merely a bad habit which is increased by cultivation. Persons affected by this disorder, for it must be considered a diseased condition, sometimes eat almost incredible quantities of food, raw meat, tallow candles, and in fact almost everything susceptible of mastication, being greedily devoured as long as the passage to the stomach will admit. In the majority of cases, voracious eating soon gives rise to serious indigestion, which protects the patient from the injuries which occur when excessive quantities of food are digested and absorbed into the system, such as fatty degeneration of the blood-vessels and various organic changes. The proper treatment for this condition is a rigid restriction of the dietary, the patient being placed, if necessary, upon a regular allowance, and carefully watched to prevent his taking too large a quantity. Not infrequently this morbid tendency constitutes one of the most serious obstacles to recovery, particularly if the pa-

tient is suffering with some other serious disease. We have frequently had patients who were evidently very desirous of recovering health, yet who appeared to be totally unable to control their appetites. If allowed to sit at the table with others, they would commit gross breaches of propriety in appropriating to themselves the whole of some favorite article of food without regard to the wants of others, eating with a rapidity and voracity more consistent with the character of a hungry beast than of a human being. In these cases the morbid tendency rarely disappears without a removal of the disease of which it is a symptom.

Malacia and Pica are terms applied to a perversion of appetite consisting in a morbid craving after particular substances; the first, for substances of a nutritious character; the second, for substances which are wholly innutritious. Cases of the first class are frequently seen in what are commonly known as the "longings" of pregnancy, and frequently similar peculiarities are observed in cases of hysteria. Examples of pica are seen in the "dirt eaters" among the negroes of the Southern States, and the clay-eating tribes which inhabit the valley of the Amazon.

The treatment for malacia and pica must vary according to the individual case. When occasioned by pregnancy, the morbid condition will not disappear until the removal of the special cause. The form of the disease often seen in young ladies who manifest a great fondness for such unwholesome and innutritious substances as clay, chalk, slate, charcoal, etc., can be treated successfully only by ascertaining the morbid condition upon which the disease is really dependent.

Polydipsia is a disease characterized by a craving for particular liquids. If water is the liquid craved, it will frequently be drank in quantities of several gallons in twenty-four hours. A patient who came under our care not long since asserted that he habitually took one gallon of water before breakfast. When such great quantities of fluid are taken, the urine is very clear, appearing almost like water, and the quantities passed are very great, which may lead to the suspicion that the patient is suffering with diabetes. A chemical examination, however, shows that this is not correct, by demonstrating the absence of sugar. The cause of this peculiar difficulty is not understood, and nothing can be done except to improve the general health and restrict the amount of water taken as much as possible. Fortunately,

60

the large amount of water taken does not seem to interfere in very great degree with the general health. This morbid condition accompanies both forms of diabetes.

Inebriety is a condition in which there is an insatiable desire for alcoholic drinks. It is generally produced by long-continued habitual use of spirituous liquors, a diseased condition finally being established which renders the will almost powerless to control the appetite.

INTESTINAL PARASITES.

According to Heller, of the fifty parasites which infest man, twenty-one are found in the intestinal canal. The principal of these are of two kinds, known as tape-worms and round-worms. Three varieties of the former, and five of the latter, together constitute the principal parasites which inhabit the alimentary canal in man. The names of these several varieties are, of tape-worms, *tænia solium*, *tænia saginata* or *mediocanellata*, and *Bothriocephalus latus;* of round-worms, *ascaris lumbricoides*, *oxyuris vermicularis* or thread-worm, *Trichocephalus dispar* or whip-worm, *anchylostomum duodenale*, and *trichina spiralis.*

The occurrence of parasites in the intestinal canal is much more frequent than is generally supposed, as they often remain for many years undiscovered. It not infrequently happens, on the other hand, that people imagine themselves to be inhabited by worms of various sorts when they are wholly free from parasites of any kind. Less frequently persons become possessed with the idea that they have within their stomachs frogs, lizards, or other reptiles or small animals, a notion which is wholly without foundation, as it would be impossible for one of these creatures to live a day in the stomach or intestines.

TAPE-WORM.

***SYMPTOMS.**—Colic pains in lower part of the abdomen, especially after fasting, relieved by a full meal; ravenous hunger; distension of the bowels with gas; alternate constipation and diarrhea; sensation of something moving in the bowels; itching about the anus; tickling of the nose; vomiting; headache; night sweats; palpitation; heartburn; cramps; in children, convulsions; numbness; deafness; blindness; the passage of portions of the worm.*

Of the various symptoms mentioned above, the last is the only positive sign of the presence of tape-worm. All the others are never

present in any one case; and very often no symptoms whatever occur except the passage of portions of the worm and of its eggs (see Figs. 276 to 278). There are no means of distinguishing by general symptoms the different varieties of tape-worm which inhabit the

Fig. 276.
Egg of Tænia Saginata.

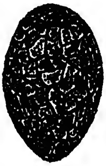


Fig. 277.
Egg of Tænia Bothriocephalus Latus.

Fig. 278.
Egg of Tænia Solium.

human body; the variety can be determined only by examination of the portions of the worm which are expelled, or their eggs, with a microscope. This is not, however, a point of great practical importance, as the same remedy is efficient for all varieties. In some cases, various other symptoms are developed, particularly those which are due to the development of hydatids in the liver, the brain, the muscles, and other organs. This may occur in consequence of self-infection with the embryos of the worm through the introduction of its eggs into the stomach by means of violent retching or vomiting.

Cause.—The only cause of this disease is the reception into the system of the embryo of the tape-worm. These embryos are only to be found in the flesh of other animals. The principal sources of human infection are beef and pork. The embryos are found in the muscular tissue, or lean meat, inclosed in little cysts, as shown in Fig. 155 on page 395. In Figs. 279 and 280 the embryo of the tape-worm, known as cysticercus, is shown of natural size and slightly magnified. PLATE IX. shows the head of an embryo such as is found in the flesh of the hog, greatly magnified. When flesh containing the embryos is eaten, the cyst is digested off by the gastric juice, and the embryo attaches itself to the mucous membrane of the small intestine, by means of its hooks and suckers. In a short time a small body is formed, which is quickly duplicated, and the process continues until from an insignificant beginning the for-

Fig. 279.
Small Embryo.

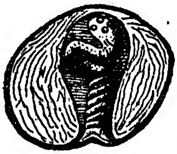


Fig. 280.
Large Embryo.

midable length of fifteen, twenty, and even forty or fifty, or more, feet is formed. Thus the worm, when fully developed, is really a chain of living creatures, each link being a separate individual, producing eggs in vast numbers, which pass out of the body in the discharges, and, finding entrance into the stomach of some other animal, develop into embryos, to be again eaten by man or some other animal, in whom the fully developed worm will be produced.

Treatment.—No patient should ever be treated for tape-worm unless the positive signs of the presence of the worm are first detected. It generally happens that segments of the worm are broken

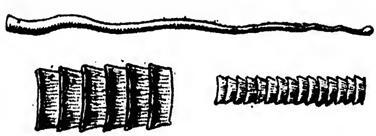


Fig. 281.
Segments of Tænia Solium, of natural size.

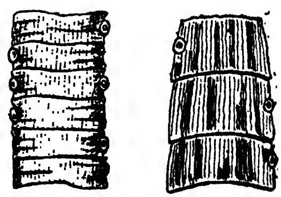


Fig. 282.
Sections of Tænia Saginata.

off and expelled at intervals; but when this does not occur spontaneously, portions may be obtained by giving the patient a mild laxative, as a small dose of castor-oil. The discharges from the bowels should be carefully examined for several days, if segments such as are shown in Figs. 281 and 282 are not discovered sooner. Persons who are well skilled in the use of the microscope may examine the discharges for eggs of the worm, which are always present in great numbers when the worm is present. We must not omit to add here the caution that portions of undigested food, masses of mucus, etc., often resemble worms or portions of worms when cursorily examined. The inspection should be sufficiently careful to avoid such an error as this. Many persons are unnecessarily frightened by appearances of this sort. Although many persons have suffered almost untold miseries under the hands of quacks without having a cure effected, it may be considered as positively demonstrated that the worm can in every case be expelled, provided that proper treatment is applied.

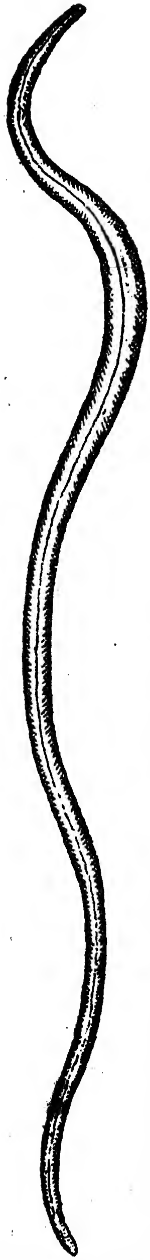
Preparatory Treatment.—This occupies two days. Give the patient only such food as will not produce much residue, as white bread, gruels, rice, and milk. Graham bread, oatmeal, cracked wheat, vegetables of all kinds, fruits, especially seedy fruits, and eggs,

should be wholly avoided. The patient should drink several glasses of cold water within an hour before each meal, and should apply fomentations and percussions to the abdomen for the purpose of causing the bowels to become as loose as possible. Large hot enemas should also be used twice a day. (See p. 663 for directions for giving large enema.) The second day, the patient may eat freely of onions for the purpose of sickening the worm. Some recommend salt herring for the same purpose, to be eaten with onions.

Curative Treatment.—The third morning after beginning treatment let the patient take for breakfast a little milk or bran coffee and dry white bread toast. Some recommend that the patient shall fast; but it is better to allow a small quantity of food, as the tendency to vomit is less. The most effective medicine is koosso. This kills the worm; and after it has acted, the dead worm must be expelled by means of a dose of castor-oil. The quantity of koosso necessary to kill the worm is five to seven drams for an adult. It should be given in small capsules, or may be taken in decoction, the whole being drunk. For children, the dose should be proportionately smaller. Two hours after the koosso has been taken, administer two tablespoonfuls of castor-oil. One of the most reliable of all remedies is "Pelleterine de Tanret," directions for the use of which accompany each package. The seeds of the common pumpkin have also been successfully used for the same purpose. Bruise two ounces of the seeds in a mortar with a little water. Add enough water to make a half pint. Strain through a coarse cloth. This is for one dose. Repeat daily for several days in succession. This remedy has the advantage of being perfectly harmless, if it does not destroy the worm.

Fig. 283.
Head of Tape-worm.

It should be remarked that many people imagine themselves to be the possessors of tape-worms when they are wholly free from anything of the sort. It not infrequently happens, also, that the general symptoms of the disease continue for a time after the worm is expelled. In order to be assured perfectly and definitely that a cure has been effected, it is necessary to examine the discharges from the bowels with great care so as to find the head of the worm, which may be distinguished by its form, as seen in Fig. 283. On account of its small size it should be sought with great care. If the head is not expelled, the worm will be likely to grow again.



Prevention.—The only sure means of prevention is the entire avoidance of the use of meat. It has been supposed that the principal source of infection is the use of raw pork; but the observations of Dr. Leidy of Philadelphia, and the eminent Prof. Cobbold of England, have shown very clearly that the most common source of infection is raw beef. Neither salting nor smoking will destroy the embryonic parasites. They will resist the action of both cold and heat in an extraordinary degree. They are only destroyed by a temperature exceeding 160° F., and require exposure for some little time. This necessitates that meat should be thoroughly cooked in order to secure immunity from infection with these loathsome parasites.

ROUND-WORMS—ASCARIS LUMBRICOIDES.

SYMPTOMS.—Itching of nose; colic pains; boring pains in abdomen; fickle appetite; distension of stomach; diarrhea, with passage of mucus tinged with blood; dark eyelids; face swollen; foul breath; unequal dilatation of pupils; unpleasant dreams; starting during sleep as if frightened; grinding of teeth; pains in limbs; irregular pulse; general wasting; also many of the symptoms described as indicating tape-worm; only positive sign, expulsion of worms.

Other symptoms not mentioned above are sometimes produced by the migratory tendencies of the worm. It seems to have a special fondness for getting into narrow places. The worms have been found in the œsophagus, the nose, the Eustachian tube, the nasal duct, the air-passages, the pancreatic and gall ducts, and even in the bladder and uterus, as well as in the stomach and intestines, where they are chiefly found. They do not usually remain long in the stomach, the irritation produced by their presence inducing vomiting. The disposition round-worms have for squeezing themselves through very small openings has been taken advantage of by an ingenious physician in the construction of a "worm-trap." This worm is represented of natural size in Fig. 284.

Fig. 284. Round-Worm, natural size.

Cause.—The only cause for round-worms is the reception of their eggs into the system. It is supposed that they are introduced into the stomach by the use of celery, salads, raw vegetables, and perhaps fruits. They may also be introduced by drinking water which has been contaminated with the soakings from privies, etc. The eggs will retain their vitality for many years, and are not destroyed by freezing or drying. The embryo, also, when partially developed, shows almost equal tenacity of life. The worm inhabits the small intestines. It is cylindrical in form, of a dirty reddish yellow or light brownish color, and seven to ten inches in length, the females being a little longer than the males. This parasite is very common in some countries, quite a large proportion of the inhabitants being affected.

Treatment.—The best remedy is *santonin.* Give in doses of one-third of a grain to infants, and one-half grain to a grain and a half to adults, to be given in capsules or in a syrup four times in one day. The last dose should be followed by a laxative dose of castor-oil.

Another very useful remedy which we have often used with success is the following: Fl. Ex. of *senna* and Fl. Ex. of *spigelia,* equal parts. Dose: one to four teaspoonfuls three times a day, according to the age of the patient. Continue this treatment for two or three days. If no worms appear in the bowel discharges, there are probably none present.

THREAD-WORM—OXYURIS VERMICULARIS.

SYMPTOMS.—Severe itching and tickling just within the anus, especially at night; unnatural sexual excitement; in males, frequent erections, and even seminal emissions; presence of the worms in the bowel passages.

Many other symptoms have been attributed to the presence of this worm, but the above are the most important. Contrary to the generally received opinion, the worm does not inhabit chiefly the rectum, but the large intestine, and especially the cæcum. Its natural size may be seen by reference to Fig. 285. In Fig. 286 is seen the worm greatly magnified and in the act of shedding its skin. The symptoms in the rectum are produced by the motions of the worms in this part, as they go down into the rectum to deposit their eggs. Sometimes they crawl out upon the skin about the anus, but in such cases soon die, as they cannot return.

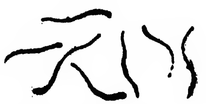


Fig. 285. Thread-worm. Natural size.

Cause.— The thread-worm is undoubtedly produced from eggs, which each worm produces in prodigious numbers. How they get into the stomach is not well known, but it is undoubtedly through neglect of proper cleanliness.

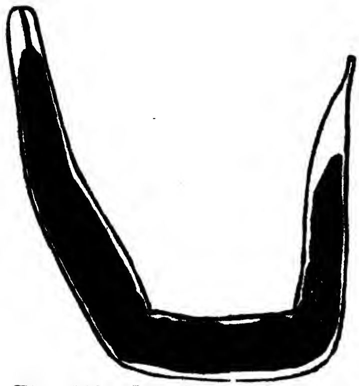


Fig. 286. Thread-worm shedding its skin. Greatly magnified.

Treatment. — It is useless to prescribe treatment for the rectum; for this mode of treating the disease has been notoriously unsuccessful. The treatment, in order to be of any real value, must reach the large intestine and especially the cæcum. According to Heller, the best remedy is a copious enema of water, or of a solution of castile soap in proportion of a dram of soap to a quart of water. From two to four quarts of water should be injected into the bowels at once. For method of giving large enema, see page 663. A handful of quassia chips may be boiled in the water instead of using soap. The remedy usually requires several repetitions. In obstinate cases, use the soap enema followed by the quassia enema every other day as long as necessary.

WHIP-WORM — TRICOCEPHALUS DISPAR.

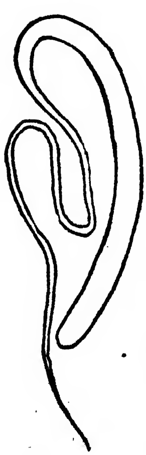


Fig. 287. Whip-worm. Slightly magnif'd.

SYMPTOMS.—Only reliable symptom, expulsion of worm or eggs.

Not a very common parasite. The form of the worm is shown in Fig. 287.

Treatment.— Same as for the preceding.

STRONGYLUS DUODENALIS.

SYMPTOMS.--Anœmia; pallor; exhaustion; dyspepsia; disturbances of the circulation; fickle appetite; morbid appetite for mortar, wood, coal, etc.; pain and heaviness in the stomach; shortness of breath; quick pulse; giddiness; ringing in ears; black spots before the eyes; dropsy; diarrhea and vomiting.

This worm occurs only in warm countries, and in this country is confined to the Southern States. The worm lives on the blood sucked from the blood-vessels of the mucous membrane to which it attaches itself. It is this that leads to the great anemia and prostration met in this disease.

Cause.—The cause is the same as that of other parasitic diseases of the intestinal canal; viz., the taking of the eggs of the parasite in the food or drink. Water from lakes or streams should be boiled.

Treatment.—In bad cases, recovery is very doubtful. The remedies best to employ are those already recommended for other worms. Oil of turpentine is stated to be very efficacious. It should be given in milk in two tablespoonful doses, quite a quantity of milk being taken afterward.

VINEGAR WORMS.

Recent investigations show that the so-called "vinegar eels" usually found in cider vinegar, sometimes take up their abode in the intestines as parasites. The best mode of prevention is to avoid the use of vinegar. The juice of lemons or other acid fruits is a wholesome and satisfactory substitute.

FLUKES.

The fluke is a parasitic worm which inhabits the duodenum and biliary passages in man. It is very common in sheep, occasioning what is known as "liver-rot," a disease from which many thousands of sheep often die in a single epidemic. In Egypt a variety of the parasite is found which gives rise to a very formidable disease. In this country, fortunately, the parasite is so seldom met with in man that it is of no medical importance.

DISEASES OF THE LIVER.

In ancient times derangements of the liver were supposed to be a fundamental condition in nearly all diseases. In the humoral theory of disease, great stress was laid upon the condition of the bile, yellow bile being supposed to produce inflammation, while black bile induced opposite conditions, together with hypochondria and insanity. In modern times, the tendency has been to the opposite extreme. When it became thoroughly established that the liver was not the seat of the mind, as was once supposed, and especially when Harvey made the discovery that the heart instead of the liver was the center of the circulation, medical men began to look upon the liver as of far less importance than it had for ages been supposed to be. Even among the common people the liver has come to be regarded as merely an organ for making bile, and it is rare that any diseased condition, besides

structural derangements, is attributed to it except such as depend upon some disturbance of secretion. The most recent investigations have shown that the ancient theory was more nearly correct than the modern one, and that while the liver is neither the seat of the mind nor the center of circulation of the blood, it performs a number of other important functions besides that of secreting the bile; namely, elaboration of certain elements of the food, by which process they are fitted to form blood; and the destruction, for the purpose of removal from the system, of worn-out particles which become sources of disease, if retained. The last-named function is independent of the secretion proper, which is both a secretory and an excretory product, being useful in the process of digestion, and at the same time containing poisonous elements which must be eliminated from the system. Recent discoveries have shown that the liver performs a most important office in the destruction of poisons. It is this function which renders possible the recovery from such maladies as typhoid fever, the liver destroying the poisons produced by the germs of the disease, upon which the fever and other symptoms depend. Diseases of the liver, like those of most of the other organs of the body, are chiefly of two classes,— functional and structural.

Functional Diseases of the Liver.—In the light of modern investigations in pathology and physiology, there is little reason to doubt but that disordered action of the liver is a morbid condition to which may be attributed a great variety of symptoms which have often been attributed to other organs. The ordinary classification of functional disorders of the liver is as follows: first, diminished secretion; second, increased secretion; third, secretion of morbid bile. As this classification is not in accordance with the most modern views of physiology, it must be discarded. In treating this subject we shall follow very closely the classification of Murchison, one of the most recent, and by far the most able, writer on diseases of the liver.

TORPID LIVER.

***SYMPTOMS.**—Bowels irregular, generally costive; discharges yellow, whitish, or drab; disagreeable taste in the mouth, usually in the morning; furred tongue, yellowish or white; loss of appetite; sallow or dingy skin; patches on the skin known as "liver spots;" white of the eye yellow or dingy; flatulence; headache in the front part of the head; dullness and heaviness most of the time; lassitude and drowsiness after meals; great depression of spirits; sediment in the urine when cold; vertigo; noises in the ears; disturbed sleep.*

Causes.—Errors in diet may justly be said to be the most frequent of all the numerous causes of torpidity of the liver. Fashionable dinners, late suppers, overeating, especially the excessive use of fats, sugar, pastry, condiments, alcoholic drinks, and tea and coffee, may be charged with being the most common causes of inactivity of this organ. The free use of mustard, ginger, pepper, curry powder, and other irritating condiments in many tropical countries, leads to the almost universal prevalence of this disease. In addition, sedentary habits, the use of tobacco and other narcotics, restriction of the liver by wearing tight clothing, and malaria should also be mentioned as important causes of this very common affection. We should also remark that the prolonged use of laxative medicines, "after-dinner pills," and the various drugs that are recommended for constipation, are most prolific sources of torpid liver. The same may be said of mercury, although this drug is less frequently used than formerly, and is seldom employed to such an extent as twenty years ago. The liver possesses the curious property of being able to retain in its structure metallic poisons which may be brought to it in the circulation, so that the effect of injuries received from a mercurial course is apt to be more or less permanent.

Treatment.—In severe chronic cases of this affection the patient must studiously avoid the use of fats, sugar, condiments, and alcoholic drinks. Regulation of the diet is a positive necessity in the radical treatment of this disease. Tobacco, if used, must also be discontinued. If the patient's habits are sedentary, he must begin a course of regular, systematic exercise, and should in every way possible build up his general health. Food should be taken in moderate quantities, and should consist chiefly of grains and acid fruits. Some patients are obliged to avoid the use of milk ; with others it does not seem to disagree. In addition to these general measures, the patient, if not emaciated, may take with advantage for two or three weeks two or three vapor baths or packs a week. The wet girdle, or *umschlag*, should be worn night and day. The use of the hot and cold douche over the liver is very efficient. Central galvanization may also be applied with advantage. The use of mercury with various laxatives, purgatives, and the hosts of liver medicines which are recommended for this very common affection, will do more harm than good. The best that any of these drugs could do would be to whip up the flagging energies of the already overworked organ without in any way lightening its burdens or giving it increased

strength to perform the labor required of it. The repeated use of remedies of this kind greatly aggravates the trouble, increasing the inactivity of the organ. Mercury does not stimulate the liver.

An aseptic dietary (see Appendix) should be adopted. Kumyzoon or buttermilk should be used in place of milk, and in many cases nut meal should be substituted for milk and butter. Fomentations may be applied over the liver daily with advantage, and a cold sponge bath may be taken every morning. Vigorous out-of-door exercise is a matter of great importance. Breathing exercises are especially helpful to the liver, as they aid the circulation of blood through the organ, thus diminishing congestion. So-called torpidity of the liver is chiefly due to the formation of poisonous substances in the stomach. The liver must be relieved, so far as possible, of all unnecessary burdens by the nonuse of meat, cheese, and all other substances which are readily decomposable or already decomposing. Intestinal antiseptics are of great value. Charcoal or charcoal tablets (see Appendix) may be constantly used with advantage in the case of persons who habitually suffer from biliousness or torpidity of the liver.

CONGESTION OF THE LIVER.

SYMPTOMS.—Gas in the stomach and bowels; weight and fullness in the stomach and in the region of the liver; heart-burn and eructation of acid matter; furred tongue; clammy, bitter taste in the mouth in the morning; nasal and pharyngeal catarrh; bowels irregular; color of stools changeable; palpitation of the heart; beating at the stomach: irregular pulse; disturbed sleep; bad dreams; disturbance of vision; vertigo; pain in front part of head; hemorrhoids; dry cough; urine highly colored; red sediment.

All of the above symptoms are not always found in any one patient, but the majority of them will be observed in all patients suffering from acute or chronic congestion of the liver. This affection is much more common than is generally supposed, and it lays the foundation for a great variety of secondary difficulties. On account of the congested state of the liver, it fails to perform its work of breaking down the waste tissues and effecting their elimination by the kidneys; consequently, the whole system is contaminated by the products of imperfect elaboration, the chief of which are uric and oxalic acids. Gout is well known to be due to the accumulation of uric acid in the system, and doubtless depends more on the inactive state of the liver due to congestion than to any other cause. Stone in the bladder, gall-stones, degeneration of the kidneys, general degeneration of the tissues of the body, local inflammations of various kinds, and numerous constitutional diseases, are un-

doubtedly due to disordered action of the liver, probably chronic congestion.

There are good reasons for believing that many constitutional diseases which are not otherwise easily accounted for, are really due to disordered liver. Among other disorders which may fairly be attributable to functional derangements of this organ, may be mentioned dyspepsia, hemorrhoids, jaundice, nervous debility, pains in the limbs, burning or scorching patches in the palms or soles, neuralgia, headache, cramp, vertigo, disturbances of vision, paralysis, mania, epilepsy, sleeplessness, depression of spirits, and nervous irritability. Various derangements of other organs due to functional disturbance of the liver, may be chiefly attributed to congestion, such as palpitation of the heart, neuralgia of the heart, feeble circulation, chronic catarrh of the throat, asthma, chronic bronchitis, chronic inflammation of the bladder, together with various diseases of the skin, as psoriasis, eczema, urticaria, pruritis or intolerable itching, boils, and brown spots in the face and hands known as liver spots.

Causes.—The causes of congestion of the liver, like those of most other functional diseases of the organ, include chronic catarrh of the stomach and intestines, and organic disease of the heart and lungs, by which mechanical congestion is produced. Among other causes, errors in diet must be mentioned as the most important. Overeating is one of the most frequent causes of this affection. A careful examination will show that the liver becomes enlarged after a hearty meal, owing to the increased quantity of blood sent into it during digestion. The use of fats, sugars, and alcoholic drinks may rightly be regarded as among the most serious dietetic errors productive of this disease, as it may easily be shown that the size of the liver is very greatly increased after a meal in which these injurious substances have been used. It has been shown also that the deficient supply of pure air, high temperature, prolonged mental anxiety, malaria, and various other conditions are productive of congestion of the liver.

Treatment.—Dr. Murchison wisely remarks with reference to the treatment of this disease, that "much more permanent benefit is to be derived from careful regulation of the ingesta [food] than from physic." Dr. Bence Jones, an eminent English physician, who is good authority on the subject, insists that "a minimum of albuminous [meat and eggs] food should be taken in order to produce less uric acid." Sugar, butter, tea and coffee, condiments of all kinds, and alcoholic drinks, should be scrupulously avoided. The food should be as simple as possible, and the

patient should be exceedingly careful to avoid overeating. The use of acid fruits is to be recommended. Much benefit may be derived from the use of water. It should be drank in considerable quantities for the purpose of thoroughly cleansing the tissues from the products of the breaking down of the system. The skin should be kept clean by daily baths. The vapor and Turkish baths, packs, rubbing wet sheet, and abdominal girdle, are excellent measures of treatment. In addition, the same measures should be employed as recommended for torpidity of the liver, a condition in many respects closely resembling congestion. Iron, quinine, and the various other tonics which are frequently prescribed for persons suffering with congestion of the liver, always aggravate the difficulty. Illustrations of this fact are found in the work of Dr. Murchison already referred to ; and we have often confirmed it by experience.

HEPATITIS.—INFLAMMATION OF THE LIVER.

SYMPTOMS.—Tenderness on the right side near the lower border of the ribs; high fever similar to that of typhoid fever; enlargement of the liver, producing sensation of fullness on right side; pain, increased by pressing up under the ribs, also by cough or a deep breath; patient cannot lie on the left side; short breath; cough; vomiting; hiccough; white of the eye yellow; pain near the right collar-bone and about the shoulder; occasionally, formation of abscesses which occasion great increase of pain and tenderness, with diarrhea and dysentery.

Causes.—The causes of inflammation of the liver are similar to those which produce congestion.

Treatment.—One of the very best means which can be employed after regulating the patient's diet, giving him only the most simple food, is the application of hot fomentations over the liver. The fomentations should be applied several times a day for ten to twenty minutes each time. They will relieve pain, and have a tendency to subdue inflammation and restore the organ to a healthy condition. In the intervals between the applications, a large compress should be kept upon the bowels over the region of the liver. The diet should be restricted to a very small quantity of the simplest food. The patient may be allowed to drink lemonade or barley-water. If an abscess continues to develop until suppuration occurs, serious consequences may result from its discharge into the abdominal cavity. Abscess of the liver may be relieved by aspiration.

Chronic Inflammation of the Liver.—The disease known by this name is really chronic congestion. The causes, symptoms, and treatment are similar to those of congestion and torpidity of the liver.

INFLAMMATION OF THE BILE-DUCTS.

***SYMPTOMS.**—Tenderness at the pit of the stomach and at the lower border of the ribs on the right side; tightness in the same region; nausea; slight fever; constipation of the bowels; jaundice; together with the various symptoms of congestion of the liver.*

This disease is generally caused by errors in diet, and is almost always preceded by symptoms of indigestion, particularly by acute catarrh of the stomach, commonly known as a bilious attack. The treatment of this affection is precisely the same as that indicated in congestion and inflammation of the liver.

GALL-STONES.

***SYMPTOMS.**—Dull pain about the liver, sometimes extending to the shoulder; chills and fever; nausea; in severe cases, attacks of vomiting accompanied by severe pains at the pit of the stomach usually coming on after some slight exertion or jarring of the body; jaundice; concretions found in the bowel discharges.*

Gall-stones are concretions or hard masses, which are found after death in the gall-bladder, or pass off during life, and may be found in the discharges from the bowels. They usually consist of cholesterine, an abundant constituent of the bile, but contain more or less of other matters also. Cholesterine is a resinous substance, and when this element predominates, the concretions resemble resin and will burn when held in a flame.

Causes.—The origin of gall-stones is not well understood. It is probable that they are caused by portions of mucus which become lodged in the biliary passages, and become centers for the accumulation of cholesterine, the coloring-matter of the bile, and various calcareous matters. The causes of gall-stones are chiefly catarrh of the bile-ducts, errors in diet, particularly the excessive use of animal food, the habitual use of alcoholic drinks, and sedentary habits of life. It has been noticed that this disease occurs very frequently in persons kept in close confinement in jails. It has also been observed that cows frequently suffer from gall-stones when kept in stables during the winter. There are also reasons for believing that the use of hard water is a common cause of the affection. The disease is most apt to occur in advanced life, and is more common among females than males.

The diagnosis of gall-stones is not positive unless they are found in the discharges from the bowels. The only method for finding them is to carefully wash the discharges through a sieve with water. This

should be done for three or four days after the paroxysm occurs if no concretion is sooner found. We have a number of specimens of gall-stones, some of which are remarkably large. In one case, the gall-bladder was greatly distended and completely filled with a single biliary concretion.

Treatment.—To relieve the most urgent symptoms, give the patient a hot sitz, vapor, or full bath, also apply hot fomentations over the region of the stomach and liver. To relieve vomiting, small bits of ice may be swallowed. Copious drinks of hot water containing a little bicarbonate of soda will also give relief. If the suffering is very great, avoid opium, but chloroform in ten- to twenty-drop doses may be used. To prevent an occurrence of the attack, all the causes of the disease should be avoided. The patient should take only the most simple foods. Fats should be avoided. For drink, only distilled or soft water should be used, which should be taken in abundance, six or eight glasses being drunk each day. The usual measures of treatment recommended for torpid liver should also be employed. The popular notion that certain medicines possess the property of dissolving gall-stones is an error which has not the slightest foundation in fact, not being sustained by experience. Medicines taken into the stomach for this purpose would never reach the bile-duct in sufficient quantity to accomplish this, although they might be able to dissolve the concretions when applied to them outside the body. The only remedy of any value whatever is to render the bile unusually fluid by drinking large quantities of water, as has already been recommended. In some cases a surgical operation is required. The writer removed fourteen large stones from the gall-bladder of one patient.

JAUNDICE.

SYMPTOMS.—Yellowness of the eyes and skin; dark or saffron color of urine; clay colored bowel discharges; itching of the skin; drowsiness; giddiness; lassitude; mental depression; irritable temper; bad taste in the mouth; slow pulse; general symptoms of dyspepsia.

Causes.—The principal causes are the following: Obstruction of the bile-duct by gall-stones or tumors, or by swelling of the mucous membrane in consequence of catarrh of the duodenum or bile-duct, the effects upon the system of certain poisons, as malaria, and the poisons which occasion yellow fever, typhoid and typhus fevers, scarlatina, etc., together with animal poisons, snake bites, and such min-

eral poisons as mercury, silver, copper, and antimony. It also occurs as the result of fright, anxiety, or any other severe mental emotion.

Infectious Jaundice.— In this form of the disease, gall-stones are not present. The jaundice is caused by closure of the bile ducts, or a portion of them, from swelling due to catarrh. The disease originates in catarrh of the stomach and bowels, and is most often caused by errors in diet. Jaundice is usually ushered in by a chill and fever, giving the disease a close resemblance to malarial fever, with pain similar to that of gall-stone, but less acute. The disease is more persistent in jaundice than in gall-stones.

Treatment.— Treatment consists in removing, so far as possible, the causes of the disease which have been enumerated. In addition to this, the patient must adopt the measures of treatment recommended for torpid and congested liver, which we need not here repeat. In case jaundice is due to partial obstruction from gall-stones, the latter affection must be treated in the manner already described.

Itching is relieved by alkaline baths, menthol liniment, and copious water drinking. In infectious jaundice, use daily fomentations over the liver and employ an aseptic dietary (see Appendix).

ENLARGEMENT OF THE LIVER.

Enlargement of the liver is often accompanied by pain, as when the result of inflammation, abscess, cancer, or catarrh of the bile-ducts. In some cases there is no pain, as in fatty and waxy liver, hydatids and hypertrophy of the organ. The symptoms which accompany the disease differ according to the cause of the enlargement and the particular form of the disease present. The abnormal size of the organ may be easily discovered by palpation of the abdomen, as the patient lies on his back with his knees drawn up so as to relieve the abdominal walls. In health, the lower border of the liver reaches only to the lower edge of the ribs on the right side, but in disease it may be extended so as to fill up a considerable proportion of the abdomen. Fig. 288 represents the normal

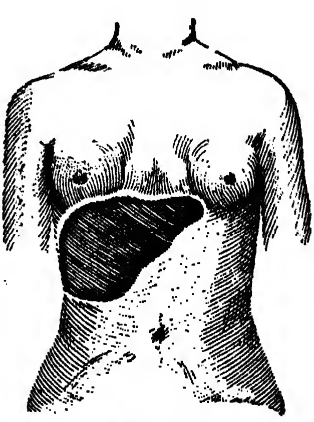


Fig. 288.
Shows the Natural Size and Position of Liver.

size and position of the liver. Fig. 289 shows the size of the liver in a case which we had under treatment at the time of this writing. It will be observed that the organ was increased to several times its natural size.

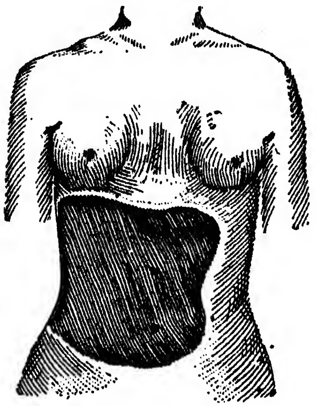


Fig. 289. Greatly enlarged Liver.

Waxy Liver.—In this form of enlargement of the liver, the tissue of the organ becomes filled with a peculiar substance, which gives to it a waxy appearance. The organ loses its natural chocolate hue and becomes very light colored. The disease most often occurs in persons who have long suffered from the daily loss of large quantities of pus, as from a chronic abscess. It is generally accompanied by a similar disease of the kidneys, which is indicated by the presence of albumen in the urine. It also occurs in consumption. For treatment, see "Waxy Degeneration of the Kidneys."

Fatty Degeneration.—In this affection, the tissues of the liver become infiltrated with fat. The disease gives very few symptoms. Its existence may be surmised, however, from the existence of fatty degeneration in other organs. It is generally accompanied by fatty degeneration of the heart, indicated by a weak pulse and febrile difficulties. The disease is produced by overeating, and by all other causes which conduce to the formation of fat and interfere with the general health. The habitual use of alcoholic drinks will produce fatty degeneration of the liver and other organs, on account of the increased amount of fat in the blood. It is often found in such wasting diseases as consumption, chronic dyspepsia, cancer, etc. In thirteen persons who died of delirium tremens, Frerichs found seven who were affected with this disease. The influence of sedentary habits in producing fatty degeneration is shown by the fact that it is almost universal in the domestic cat. The fact is also well known to pathologists that the liver of a cat is generally selected for the purpose of demonstrating the microscopical changes which take place in this disease, when a specimen of human liver subject to this disease can not be readily obtained.

Treatment.—The patient should avoid butter, fats, sugar, alcoholic drinks, tea and coffee, and in fact all articles of food conducive to the production of fat. An abundance of out-of-door exercise should be taken. Great attention should be given to the general health.

HYDATID TUMOR OF THE LIVER.

This is a disease in which cysts are formed in the liver, being developed from the echinococcus. The origin of these cysts is very curious. Eggs from the tape-worm from the common dog find entrance to the stomach through the food or drink, being developed into minute embryos, which find their way into the liver, there forming the cysts which are characteristic of this disease. The dropsical enlargement becomes so great as to cause inconvenience to the patient. Death sometimes occurs from rupture of the cyst and discharge of its contents into the abdominal cavity, chest, veins, or some other internal part. In Iceland the disease is so very common that it is said to be the cause of at least one-seventh of the whole number of deaths.

Treatment.—The only measure of treatment of any value is removal of the fluid by means of the aspirator. It has been found that if one-half or two-thirds of the fluid be removed, the disease will disappear in a majority of cases. Electricity has also been used with success in the treatment of cases of this kind.

GIN LIVER.—CONTRACTION OF THE LIVER.

Diminution in the size of the liver is by no means so common an affection as enlargement of this organ. The most common cause is the use of alcoholic drinks, which occasions what is known as atrophy, or cirrhosis, of the liver. This form of liver is seen in Fig. 290. It is sometimes called "hob-nail" liver on account of the great abundance of small nodules seen upon the surface. The first symptoms of the disease are those of alcoholic poisoning, which are nausea, retching in the morning, accompanied by a sinking feeling, loss of appetite for solid food, bitter taste in the mouth, pain after eating, irregularity of the bowels, piles, turbid urine, and mental depression. After a time, the patient becomes sallow and emaciated, and reddish spots appear upon the face in consequence of

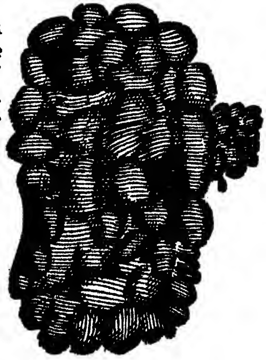


Fig. 290. Gin Liver.

the enlargement of the veins; also in most cases there is a dull pain low down upon the right side, and pain in the right shoulder. Sometimes the roughness of the surface of the liver may be felt through the abdominal walls. If the disease has existed some time, abdominal dropsy occurs from obstruction to the portal circulation ; also enlargement of the external veins of the abdomen, due to the same cause. Piles is an almost constant accompaniment of the disease, being produced in the same way. Disease of the kidneys is also quite likely to be present.

Treatment.—Total abstinence from all stimulants. The diet must be of the plainest and simplest character, all fats, sweets, spices, pastry, and all other foods difficult of digestion being carefully avoided. Abdominal dropsy should be treated as described elsewhere. The treatment and diet recommended for torpid liver (see page 954) are most appropriate for cases of this class.

DISPLACEMENT AND DISTORTION OF THE LIVER.

The morbid conditions of the liver considered under this head are wholly attributable to the abuse of the organ by tight lacing. Figs. 291, 292, 293, and 294 are representations of livers found in patients in post-mortem examinations, which illustrate the terrible effects of following the custom of constricting the waist. The custom is not wholly confined to the female sex, as might be supposed. In Fig. 291 the organ is so distorted as to be scarcely recognizable. The lower portion has been crowded down into a conical form, and the whole organ has evidently been so compressed as to render the proper performance of its functions impossible. In Fig. 292 the compression has been applied somewhat differently, and consequently a different effect has been produced, the organ having been nearly cut in two by the continuous pressure brought to bear upon it. Fig. 293 represents a liver which has been divided into three parts, or lobes, in the lower of which can be seen several enlarged veins, branches of the portal vein, which have become enormously distended by the long-continued pressure. Fig. 294 illustrates a case in which

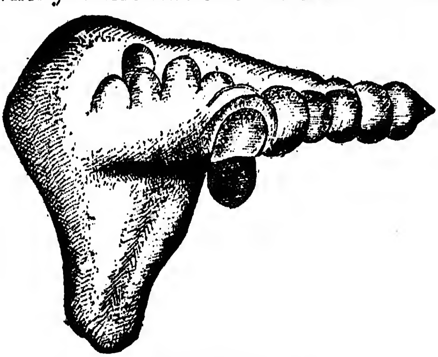


Fig. 291.
Liver Distorted by Tight Lacing.

the pressure applied about the waist was so great that the liver was compressed entirely out of its normal position, being crowded down

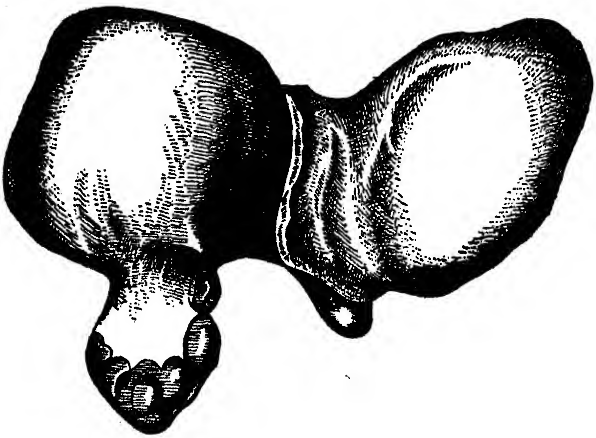


Fig. 292. Liver Deformed by Compression.

wholly below the ribs, until its rounded surface, which should be presented upward, is presented outward against the abdominal wall, giving the deceptive appearance of enormous enlargement.

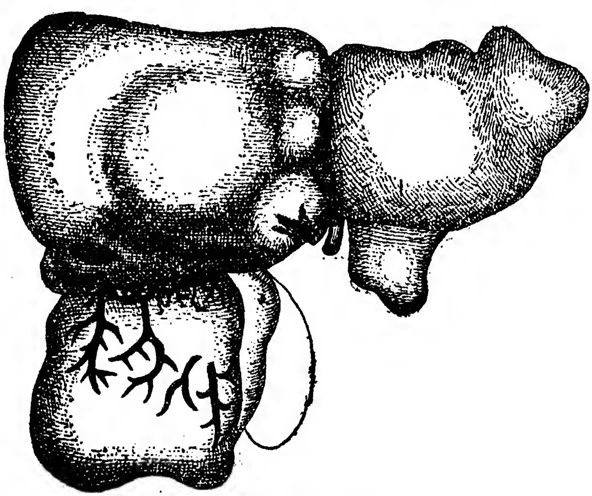


Fig. 293. Liver Showing Effects of Compression.

When pursuing a special course of study in this class of diseases in Bellevue Hospital several years ago, we encountered the case of a

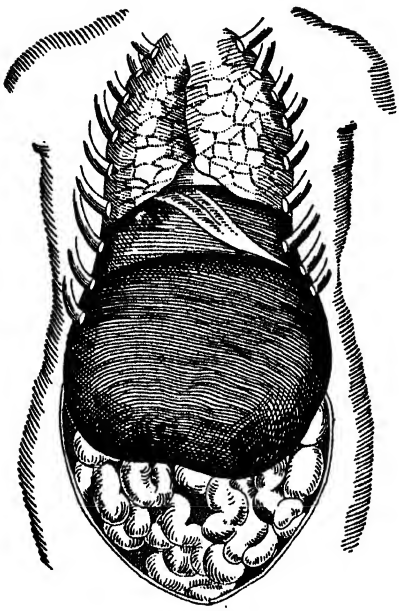


Fig. 294.

woman in whom the condition of the liver was as represented in Fig. 295. The constriction of the waist had been so great that the liver was almost literally divided in two. The case was in fact a typical one of "tight-lace fissure of the liver."

It is stated on good authority that displacements and distortions of the liver in consequence of tight lacing are exceedingly common. Indeed, it is impossible to believe that any liver could be subjected to the abnormal conditions necessitated by the modern fashionable dress without being compressed out of its natural shape and position. The only remedy, of course, for displacements and distortions is to discontinue the cause, and to employ such means as will, so far as possible, restore the distorted parts to their normal condition. In the majority of cases this can be accomplished only to a slight degree, as the distortion becomes permanent after it has existed for a number of years.

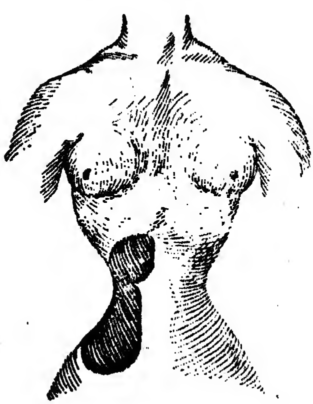


Fig. 295.

As before remarked, women are not the only transgressors in this direction. The habit of sustaining the pantaloons by buttoning them tightly about the waist, or holding them by means of a tightly buckled belt, is a very bad one, and may produce as much distortion of the liver as tight lacing in ladies. Some years ago, the injury resulting from the general prevalence of the habit in the Russian army became so apparent that a royal edict was issued prohibiting it.

ENLARGEMENT OF THE SPLEEN.—AGUE-CAKE.

***SYMPTOMS.**—Sallow countenance; paleness of the lips and gums; dyspepsia; emaciation; liability to hemorrhage; sense of weight and uneasiness on the left side. When great, the liver may be felt below the border of the ribs on the left side.*

In cases in which enlargement of the spleen is slight, none of the above mentioned symptoms may be present.

Cause.—Enlargement of the spleen is a frequent result of malarial poisoning. It generally occurs, to some extent at least, in all cases of malarial disease, and also in typhus and typhoid fevers, and various other acute diseases, especially those of an infectious character. Why this enlargement occurs is not understood, but the most recent view on the subject, as elucidated by Prof. Mosler in Ziemssen's Encyclopedia, is that the spleen acts somewhat as a strainer for the blood, and gathers to itself the disease germs and other morbid elements which are circulating in the vital fluid. Numerous experiments which have been made upon animals seem to confirm this view. It is thought by the distinguished author mentioned, that mercury and various other drugs are productive sources of disease of the spleen. It has also been observed as the result of disease of the heart, lungs, and liver.

Treatment.—Recent experiments made by Mosler, Fleury, and various eminent German authorities, have shown very clearly that the cold douche is one of the most effective of all remedies in the treatment of enlargement of the spleen. In cases in which the enlargement is very marked, it is frequently possible to demonstrate an actual decrease in size of the organ immediately after the application of a cold douche. We usually employ in such cases the alternate hot and cold douche, using temperatures as extreme as the patient can bear without great discomfort, and have obtained very excellent results. Various other means of applying heat and cold alternately are also useful. Another remedy of value is the abdominal bandage, or wet girdle. It should be worn constantly for several weeks. If irritation of the skin is produced, the bandage may be left off during the day. Vapor and Turkish baths, wet-sheet packs, and other powerful derivative measures, are also useful in the treatment of this affection. There is also some evidence that electricity is a valuable remedy in these cases. **The galvanic current is especially useful.**

SYMPTOMS RELATING TO THE DIGESTIVE ORGANS.

Under this head we shall notice briefly, for the convenience of the reader, the most important symptoms which require attention in the treatment of diseases of the digestive organs, and which have not previously been noticed at all, or at least but briefly, giving also ready and simple methods of treatment for the same.

Flatulence.—Gas in the stomach and bowels comes from the fermentation of imperfectly digested food. Restrict the quantity of food. Avoid starch, sugar, butter, all sweets and fats. Also avoid tea, coffee, chocolate, and all other drinks at meals. Use soft boiled eggs, rare beef, and dry food. Relieve the bowels regularly. Wear wet bandages at night. Knead and percuss the bowels a great deal. Take a teaspoonful of powdered charcoal in a little water after each meal, or eat one or two charcoal crackers.

Acidity.—Avoid sweet and starchy foods, soups, coarse vegetables, raw fruits, and drink at meals. Eat slowly and of dry food. Avoid mixing fruits and vegetables. In many cases milk must be discarded. Acidity may be due to fermentation or hyperpepsia. When due to fermentation, lavage should be employed once or twice a week, and sometimes daily for a week or two. Two or three charcoal tablets should be taken after each meal. The common use of soda in these cases is harmful. The use of a dry food, such as granose or zwieback, well masticated, is important. When the acidity is due to hyperpepsia, half a teaspoonful of bicarbonate of soda in a glass of water may be taken with advantage two or three hours after eating. In very severe cases take immediately after eating. In acidity, a test meal and examination of the stomach fluid is often necessary for a satisfactory diagnosis.

Heartburn.—This condition differs so little from the preceding that it is relieved by the same remedies. A very few sips of hot water will sometimes give prompt relief, and if taken a half-hour after the close of the meal, will usually prevent the occurrence of this troublesome condition. The patient must abstain from all sorts of fats and greasy foods most scrupulously, as well as from sweets. In many cases, it is well also to make use of but little flesh food, for a time, at least.

Nausea.—When present soon after eating, give the patient frequent small sips of hot drink, either water alone, or water to which a

few drops of camphor, peppermint, winter-green, or some other aromatic has been added. Also apply hot fomentations over the stomach constantly for an hour or two. The hot-water bag may be used with advantage instead of moist heat. In some cases a few sips of strong lemonade, taken very hot, gives immediate relief. In obstinate cases, the patient may take three or four drops of dilute muriatic acid in a tablespoonful of water, drawing the acid liquid through a glass tube or a straw, to avoid injury to the teeth. If the stomach is empty, small sips of iced water or bits of ice may be swallowed at frequent intervals. Ice to the spine, opposite the stomach, and the local application of electricity—either faradization or galvanization,—are measures to which we have often resorted with success when other means have failed. When the nausea evidently arises from the presence in the stomach of substances which ought to be expelled, as indigestible articles which have been eaten, or the irritating products of indigestion, vomiting should be induced by drinking copiously of warm water. Lavage, by means of the stomach-tube, is the only satisfactory means of cleansing the organ. Vomiting does not empty it.

Vomiting.— Employ the same remedies recommended for nausea, applying them with greater energy and persistence. Sometimes ice to the stomach will give relief when other measures fail. If relief is not otherwise obtained, employ lavage.

Regurgitation of Food.— Many dyspeptics habitually spit up the food eaten very soon after each meal. Often the food is raised to the mouth by an involuntary effort which cannot be controlled by the will, the food spit out being in the same condition as when swallowed. In some of these cases the regurgitation is the result of habit; in others, it is due to a morbid irritability of the stomach. In both classes of cases it is important that the patient should remain very quiet for an hour or two after eating. The food should be dry in character, and restricted in quantity at first, the patient being gradually accustomed to larger quantities until able to take as much as necessary. When the food thrown up is very acid, the remedies recommended for acidity should be employed.

Swallowing Air.— The curious habit of swallowing air, known as wind-sucking, or cribbing, in horses, is sometimes acquired by human beings. After a few acts of swallowing accomplished by much effort, the patient will sometimes belch very large quantities of air. We have met with but a few cases of this rare disease. The only cure is to

watch the patient carefully for a few hours after each meal, compelling him to desist should he be observed in the act of repeating the practice.

Heaviness at the Stomach.—Persons suffering with various forms of stomach derangements often complain of a feeling of weight or heaviness at the stomach after eating, even though the quantity of food taken be very small. This is particularly common in cases of chronic catarrh of the stomach. Relief will usually be obtained by sipping hot water in very small quantities and applying hot fomentations over the stomach for half an hour after a meal. We have cured several patients by having them wear a hot bag over the stomach for an hour or two after each meal. The alternate hot and cold douche daily applied to the spine, opposite the stomach, is an excellent measure of treatment. The wearing of the warm moist abdominal bandage at night is also a good remedy. The Natural Abdominal Supporter (see Appendix) is necessary in many cases.

Faintness.—An unpleasant sensation called "faintness," or an "all-gone feeling," occurring before or sometimes after meals, is a frequent source of very great annoyance to many sufferers from stomach disorders. One of the best means of relief is taking a few sips of ice-cold water or of hot lemonade. The common practice of eating to relieve the unpleasant sensation, while it affords temporary relief, aggravates the evil in the end. Discontinue the use of condiments; restrict the use of animal food; when very faint, drink a little cold water. **Subcarbonate of bismuth, twenty-grain doses, is a good remedy.**

Pain in the Stomach.—Apply hot fomentations over the seat of pain. In case this does not give relief, apply ice over the stomach and fomentations to the spine, giving the patient small bits of ice to swallow. A large drink of hot water will frequently stop the pain at once. Cramp in the stomach can usually be relieved in the same way.

Pain in the Bowels.—Apply hot fomentations and administer a hot enema. Repeat applications at intervals of half an hour for two or three hours, if not relieved before. Cramp in the bowels will usually yield to the same remedies.

Pain in Small of Back.—Hot fomentations to the back and stomach afford most prompt relief, though sometimes they must be continued for some hours when the pain is severe, and the patient must be kept very quiet. Daily rubbing of the painful parts, and

the use of alternate hot and cold applications, together with the abdominal girdle worn nights, are also useful measures.

Pain beneath Shoulder-Blades.—Generally due to disorder of the stomach. Relieved by fomentations over stomach, with daily rubbing, and the application of moist or dry heat to the seat of pain.

Fullness, Weight, and Pain in Right Side.—The various unpleasant sensations felt under the lower ribs upon the right side are partly attributable to disease of the duodenum, and partly to congestion and inactivity of the liver. Fomentations applied daily, with rubbing and percussion of the side, together with the judicious use of electricity and the moist abdominal bandage worn at night, constitute the principal measures of treatment.

Pain under Ribs on Left Side.—A dull pain is frequently felt in this region, due to enlargement or congestion of the spleen. The best remedy is the abdominal bandage worn night and day for a month, and the use of hot and cold applications used in the form of the douche or of compresses rapidly changed. Eminent German authorities pronounce this the best of all remedies for enlargement of the spleen.

Painful Defecation.—In relieving the bowels, many persons suffer with pain, the most common cause of which is hemorrhoids, or piles, which also often occasion a considerable hemorrhage in addition to a dull, heavy pain. A sharp, acute pain is generally due to a fissure or fistula. In some cases the pain is greatest in the act of defecation, in others it is most severe half an hour later. The latter is the case when the pain is the result of fissure. Of course the proper mode of treatment will include radical measures or surgical interference; nevertheless, much can be done to mitigate the sufferings of the patient without a surgical operation. One of the very best means we know of is evacuation of the bowels in steam over warm water. Instruct the patient to sit over a vessel nearly full of hot water, as hot as can be borne without burning. This will so relax the parts as to greatly diminish the pain; and if the contents of the bowels have been softened by an enema, as should always be done, the patient may get along with scarcely any pain at all. We have often relieved in this way persons who had suffered for twenty years without any mitigation of their suffering.

Tenesmus, or Constant Desire to Relieve the Bowels.—This unpleasant symptom is best relieved by an injection into the rectum of cold or even iced water at frequent intervals. Cool or cold hip baths, quite shallow, are also useful in these cases. In some cases, hot enemas give most prompt relief.

Weakness in Bowels.—Apply the cold douche daily, and follow with vigorous rubbing. An abdominal supporter is necessary.

Loss of Appetite.— Sun-baths, daily massage and inunction, and general tonic treatment, are indicated. Give simple food served attractively and not more than three times a day. Let the patient drink a glassful of hot water half an hour before each meal. Create a demand for food, and the appetite will soon come if there is power to digest it. The use of bitters and various tonics is not necessary.

Voracious Appetite.—Self-control is the only sure remedy; but the disuse of stimulating foods will aid very much in enabling a person to control his appetite. We have often recommended persons troubled in this way to eat a morsel of food half an hour before the time for the regular meal. This will often lessen the craving for food

APPENDICITIS.

***SYMPTOMS.**—Pain and tenderness low down in the abdomen, on the right side; swelling and rigidity of the abdominal wall over the seat of pain; chill, fever, and other symptoms of inflammation; sometimes vomiting; often constipation; frequent recurrences.*

This disease, formerly known as typhlitis, perityphlitis, etc., consists of an inflammation of the appendix vermiformis, various forms of which have been described, all tending to suppuration, perforation, and peritonitis. At the beginning of an attack, the bowels should be moved by a large enema containing a little soap or an ounce of sulphate of magnesia. Fomentations should be assiduously applied over the affected part, as they tend to prevent the formation of abscess. A little turpentine may be sprinkled on the fomentation cloth to increase the counter-irritant effect. If the swelling and pain continue, an operation may be necessary, but it should not be performed until after the acute inflammation has subsided; it should not be long delayed, however, unless there is decided improvement within forty-eight hours. If the attacks frequently recur, an operation should be performed, even though relief is obtained by non-surgical treatment, as general peritonitis and death may occur, even after several recoveries have taken place. The patient should take a fluid diet consisting of kumyzoon, fruit juices, and gruels.

DISEASES OF THE RESPIRATORY ORGANS.

PHYSICAL DIAGNOSIS.

It is only within the last century that diseases of the lungs have been well understood. The greatest aid to their investigation has been rendered by the discovery by Laennic of the stethoscope, and the perfection of the several means of examination of the lungs employed in "physical diagnosis," which comprise *inspection*, *palpation*,

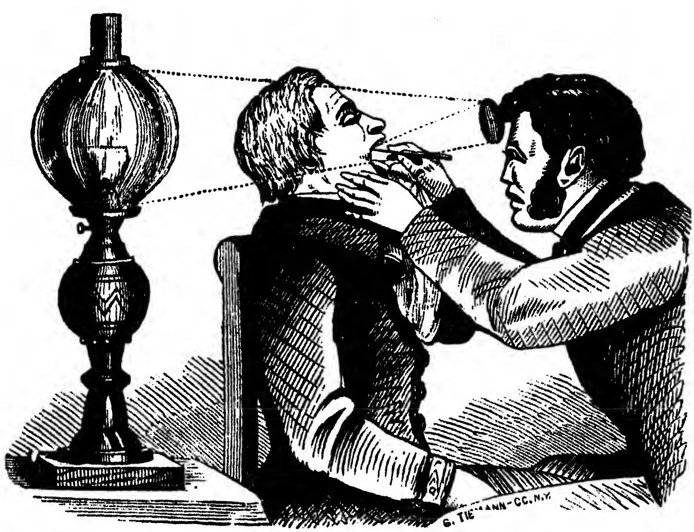


Fig. 296. Using the Laryngoscope.

mensuration, *succussion*, *percussion*, and *auscultation*. Of these, by far the most important are the last two. We have space here only for a very brief description of each.

Inspection.—This consists in critically viewing the chest. By this means we discover whether there is proper motion of the walls of the chest, or whether there is unequal motion. We may also discover bulging of portions of the chest from various causes.

By means of an instrument known as the laryngoscope, shown in Fig. 296, it is possible to inspect the larynx and even the upper part of

the trachea. By means of the same apparatus the nasal cavity may be examined. The instrument consists essentially of two mirrors, one of which, a small one, is attached to a handle, by means of which it is held at the back part of the mouth. A strong light is focused upon

Fig. 297.

the small mirror by a larger concave one, which is held in position by means of a band encircling the head. By holding the two mirrors in proper positions, the light may be thrown into the larynx or nasal cavity, bringing all the parts into distinct view. When seen by means of the laryngoscope, the healthy vocal cords appear as seen in Fig. 297 in different stages of respiration. In Fig. 298 the same organs are represented as seen in a case of ulceration of the larynx.

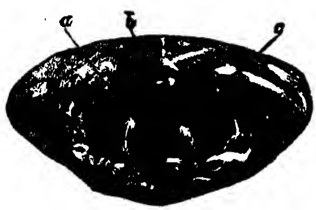


Fig. 298.

Fig. 299 shows a very convenient form of tongue depressor which is useful in inspecting the condition of the throat, and in connection with the use of the laryngoscope. In the absence of a better instrument for this purpose, the handle of a teaspoon may be used.

Fig. 299.

Palpation is the term applied to examination of the chest with the hands. By the aid of the sense of touch, much may be learned of the condition of the lungs. In health, the resonance of the voice gives to the chest a slight vibratory movement, known as *vocal fremitus*,

which can be felt by means of the hand. This movement is most marked upon the right side, and is increased in diseases which cause solidification of the lungs, as in pneumonia.

Mensuration.—This consists in measurements of the chest. By means of mensuration the degree of mobility of the chest walls and the breathing capacity may be ascertained, also any departure from the natural symmetry caused by the accumulation of fluid in one side, morbid growths, etc.

Succussion is a shaking movement given to the chest for the purpose of detecting the presence of fluid. When air is also present in the pleural cavity, sounds will be produced by the splashing of the liquid serum or pus; if no air is present, no sounds will be heard, even though a considerable quantity of fluid may be contained in the chest.

Percussion.—This is one of the most important of all means for examination of the chest. It consists in striking upon the chest-wall for the purpose of comparing the sounds produced by the percussion with sounds similarly produced in health. Percussion is best performed by placing the forefinger or middle finger of the left hand upon the chest, preferably in the space between the ribs, and striking it a quick elastic blow with the tips of the fingers of the other hand. The force of the blow should be sufficient to elicit a distinct sound. The sounds may be intensified by placing the patient so that his shoulders may rest against a door. Care should be taken to have both shoulders supported equally. The percussion should be performed upon the bare skin or with not more than a single thickness of muslin over the flesh. When performed outside the clothing, as we have often seen it done, nothing accurate can be learned of the state of the lungs. One side of the chest should be compared with the other. Sounds produced in this way differ chiefly in quality and pitch. The sound produced in health by striking the chest has a peculiar resonant quality called *pulmonary resonance.* It is never heard elsewhere. The pitch is low. When this sound is somewhat muffled, it is said to be *dull.* This condition naturally exists at the apex of the lung, above the clavicle, and below the fifth rib on the right side, over the liver. When the resonance is absent, the condition is known as flatness. This sound may be found in health over the kidneys and the lower part of the liver, near the seventh rib. Dullness is found in

pneumonia and consumption, being produced by consolidation of the lung. Flatness is sometimes found in the same diseases and also in dropsy of the chest. *Tympanitic resonance* is another modification of sound which may be found over the stomach and bowels in health. It is noticed in cases in which one side of the chest has been filled with air, the lung itself having collapsed, a condition known as pneumo-thorax. It is also sometimes observed when large cavities have formed in the lungs. In cases in which cavities exist in the lungs, two other peculiar modifications are sometimes produced; viz., *amphoric* resonance, which is produced by a cavity possessing rigid walls, and the *cracked-pot* resonance, produced when the walls are flaccid. The first sound is like that produced by tapping upon a bottle. The second is described by its name, the peculiarity being due to the coming together of the walls when percussion is performed. It is heard only when the patient's mouth is open and placed near to the ear of the examiner.

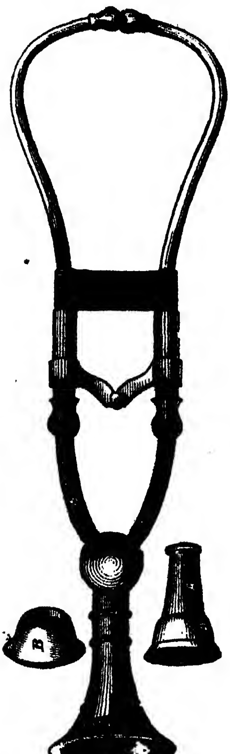


Fig. 300.

Percussion is sometimes practiced with an instrument called a pleximeter, consisting of a hammer and a small disk, the latter being placed upon the chest-wall and struck with the hammer. The fingers are much more efficient and accurate than any artificial means which has yet been devised.

Auscultation.—Many of the most important indications respecting diseases of the chest are obtainable only by this means, which consists in listening at the chest wall by the ear alone, placed against the chest, or by the aid of an instrument known as the stethoscope, a cut of which is shown in Fig. 300. In auscultation, attention is given to both inspiration and expiration. Each has its particular characteristics in health and in disease. In health, the inspiratory sound is of a peculiar breezy character, and low in pitch; the expiratory sound, if present, very short, and still lower in pitch. The sounds heard over the large bronchial tubes at the upper part of the sternum differ from this quite materially, resembling that produced

by air drawn through a tube, being high in pitch, and the expiratory sound higher than the inspiratory, and continued longer.

The Breathing in Disease.—1. The breathing may be exaggerated. This most often occurs in a portion of lung which is overworked on account of the inactivity of some other portion. It is also heard in emphysema in some cases. It is common in children in health.

2. Diminished breathing is noticed in consumption in the affected portions. It also occurs in some cases of emphysema.

3. The breathing may seem to be suppressed altogether in pleurisy accompanied by a considerable quantity of fluid, in pneumonia, consumption, and obstruction of the bronchial tubes.

4. Bronchial breathing is heard in parts of the chest in which it ought not to occur, in diseases in which the lung becomes solidified, as in pneumonia and consumption.

5. Peculiar sounds are produced by air passing through cavities in the lungs. They are sometimes musical in character, often resembling the sound produced by blowing into a bottle.

6. In chronic bronchitis and emphysema, sibilant or whistling and sonorous sounds often accompany respiration. These sounds are produced by contraction of the air-passages at some points.

Rales.—Certain sounds known as rales are often heard in disease of the lungs, never in health. They are chiefly of four kinds, as follows: 1. Crepitant rales, a fine, dry, crackling sound, heard just at the end of inspiration, not at all in expiration, most distinct just after the patient coughs; heard in consumption, pneumonia, and pleurisy. 2. Subcrepitant rales, a fine bubbling sound, heard in both inspiration and expiration. It occurs in bronchitis, pleurisy, consumption, pneumonia, and in œdema of the lungs. 3. Mucous rales, similar to subcrepitant, but louder and coarser. Heard in pneumonia, acute and chronic bronchitis, and in consumption. 4. Gurgling rales are heard over small cavities. Sibilant and sonorous rales are mucous rales heard with sibilant and sonorous respiration.

The Voice in Disease.—The natural sounds of the voice are much modified by disease. The following are a few of the most important modifications: 1. The voice, or vocal resonance, may be increased, as is usually the case in consumption and pneumonia, and sometimes in emphysema. 2. The vocal resonance is diminished when there is a slight accumulation of fluid in the chest. 3. The voice may be sup-

pressed entirely, as is the case where there are large collections of fluid in the chest. 4. Bronchophony, egophony, pectoriloquy, the amphoric

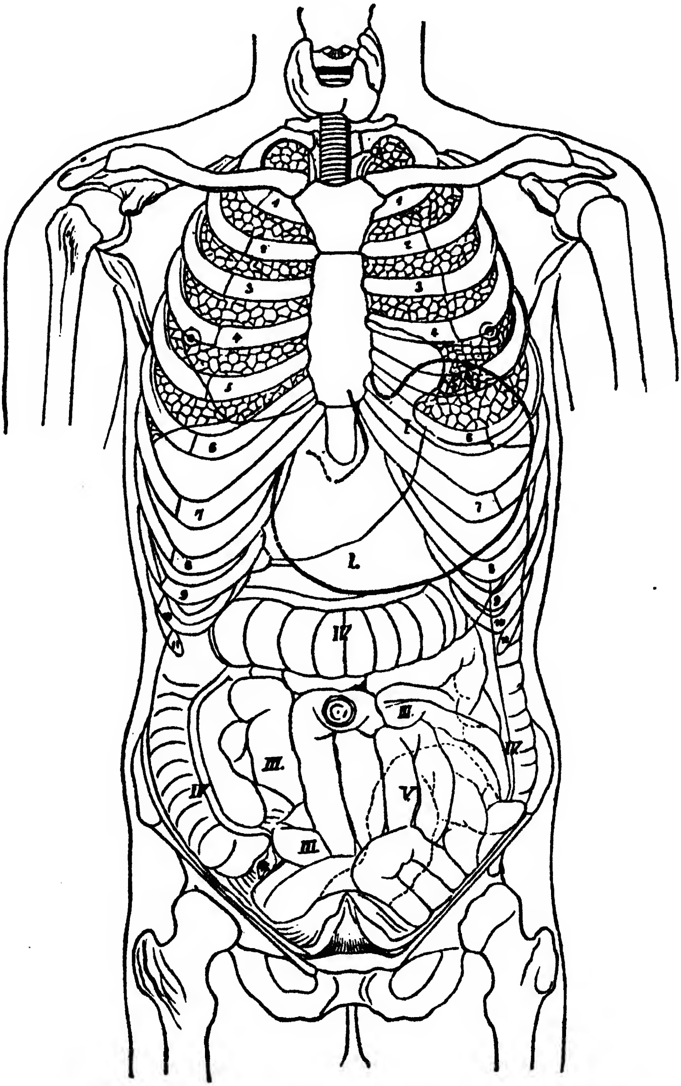


Fig. 301. Outline cut, showing relative position of the internal organs.

voice and metallic tinkling, are peculiar sounds sometimes heard in the chest, each of which has its particular significance, but requires the ear of a skilled examiner to detect.

The *telephone voice* is a peculiar modification of the whispered voice which is heard at the surface of the liquid in the pleural cavity.

Expectoration.—Much can be learned of the condition of the lungs from an examination of the matters expectorated, or what is technically known as the sputum. The chief points of interest in relation to the sputum are its consistence, quantity, odor, color, and constituents.

Consistence.—The density of expectorated matter varies greatly. It may be tough or tenacious or a limpid fluid. When very firm, it consists almost wholly of mucus, and is an indication of a high degree of irritability of the mucous membrane. This kind of expectoration generally has the form of little round masses which are raised with great difficulty. When the sputum comes from enlarged bronchial tubes, or from cavities in a consumptive lung, it contains some pus and is less firm. The rounded masses are then somewhat flattened, but retain their form for some time after expectoration. Opaque fluid sputum is usually pus. It occurs in bad forms of bronchitis of long standing, in abscesses of the lung, and in cases of empyema in which an opening into the air passages allows the pus in the pleural cavity to escape into the lung. It often occurs also in the advanced stages of consumption, at intervals. A clear, fluid expectoration indicates œdema of the lung from passive congestion. Frothy mucus, or that which contains much air, floats upon water, while that of greater consistence sinks. When the sputum sinks and retains its rounded form, it is generally supposed to indicate the presence of a cavity in the chest; but the evidence is by no means positive, as the same kind of sputum may occur in bronchial catarrh.

Quantity.—The quantity of expectoration is not very significant, since it may be quite abundant in very mild cases, and scanty in the most severe ones. As a general rule, especially in whooping-cough and acute bronchitis, the increase in the quantity of sputum and the disappearance of the difficulty in raising it, occur at the same time. When the sputum becomes scanty, the violence of the cough greatly increases. The sudden cessation of expectoration in a case in which it has been quite copious is a very bad symptom, especially if the patient shows signs of weakness. This is one of the forerunners of death in consumption. A very copious expectoration, as of several tablespoonfuls at a single act of coughing, is indicative of a pulmonary abscess, or of empyema

if it occurs but once, and suddenly. If habitual, occurring perhaps every morning, it is evidence of dilatation of the bronchial tubes.

Odor.—The odor of the sputum is not usually marked; but it becomes very fetid when it is long retained in the lung before expectoration, as in enlargement of the bronchial tubes in cases of chronic bronchitis, in abscess of the lungs, in the putrid form of bronchitis, and in consumptive cases with cavities. The odor is extremely bad in cases of gangrene, when the lung substance is undergoing rapid destruction.

Color.—Red sputum of course indicates the presence of blood. When the blood is not expectorated at once, but becomes mixed with mucus, the sputum will be likely to be reddish brown or very slightly tinged with red. The rusty sputum seen in pneumonia owes its color to the presence of blood. In some cases, after blood has been retained for some time, it gives to the sputum a yellow or greenish color. These colors are generally due, however, to the presence of pus. The occurrence of jaundice in a person who is expectorating freely usually causes the sputum to assume a yellow or green color. The sputum is often colored by dust inhaled, as by coal dust in stokers, miners, and those who labor in coal.

Constituents of the Sputum.—Some idea of the constituents of the sputum can be obtained by attention to the points already mentioned; but in cases in which there is any obscurity, a careful microscopical examination of the sputum is of the greatest importance, as by this means much positive information can be gained that will be sought in vain in any other way. The microscope always shows the presence of more or less epithelium in the sputum, which usually comes from the mouth, as shown by its character. See Fig. 302. In Fig. 303 may be seen a representation of the peculiar ciliated epithelium which comes from the bronchial tubes. It is sometimes found, also, in mucus from the nasal cavity. In red or rusty sputum, red blood corpuscles, often very numerous, are usually found. Pus cells are found in putrid bronchitis and in all cases in which there is a destruction of tissue in the throat or lungs, either from consumption or ordinary ulceration. They resemble the white corpuscles of the blood; and, indeed, it is believed that they are, at least

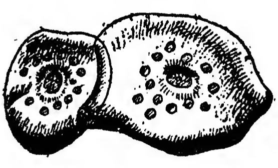


Fig. 302. Pavement Epithelium from the Mouth.

Fig. 303. Cylindrical Epithelium.

in part, identical with the white cells of the blood, which find their way out of the blood-vessels. When destruction of the lung is taking place, fragments of tissue may be recognized by the microscope in the sputum. The most characteristic of these is yellow elastic tissue, fibres of which are shown in Fig. 304. In cases of advanced consumption, these fibres are always found in the sputum, and constitute a sure means of distinguishing the stage of the disease, and of confirming a diagnosis. The most positive means of diagnosis of tuberculosis of the lungs is the microscopical examination of the sputum for the tubercle bacilli, the germ which is characteristic of the disease. This examination can be made only by an expert physician who has given special attention to the subject.


Fig. 304. Yellow Elastic Tissue Fiber from the Lungs.

In croupous bronchitis, the sputum frequently contains casts of larger or smaller portions of the bronchial tubes, which may be easily made out by examination of the expectorated matters. A very large cast of this kind is shown in Fig. 305.

The sputum often contains various foreign matters, and when putrid, always shows the presence of *bacteria* and various other low organisms which accompany the putrefactive process.

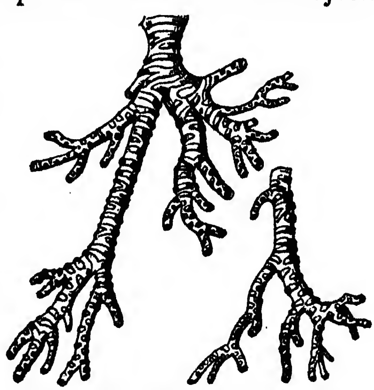


Fig. 305. Cast of Bronchial Tubes.

COLD IN THE HEAD.—CORYZA.

SYMPTOMS.—Chilliness; sneezing; snuffing; lassitude; pain in the forehead; watery discharge from nose, becoming thick and yellow after two or three days; aching in the limbs and back; fever, as indicated by thirst, loss of appetite, and dryness of the skin; eyelids swollen; eyes congested, often suffused with tears.

"Cold in the head" is a simple inflammation of the mucous membrane of the nasal cavity, and is one of the most common of all affections. It is generally thought to be the result of taking cold, as by getting the feet wet, etc., but it evidently has other causes as well. Sudden checking of the action of the skin by exposure to drafts while it is in a heated

state is undoubtedly one of the chief causes. Irritating substances, such as ipecac and fluorine gas will produce this affection in certain individuals. There is also reason for believing it to be contagious, as it may be observed to go through a whole family without there being any other apparent cause than that of contagion. Recent investigations have shown that influenzas or contagious colds are due to specific microbes. Ordinary colds are due to the germs which are always found in the air and in the nasal cavities. A hard cold renders a person subsequently more susceptible to colds than before. Some persons seem to be remarkably susceptible to taking cold. The disease usually lasts from two to seven days and usually terminates in recovery, although when it is frequently repeated in the acute form, it may become chronic. In some cases the frontal sinus and the antrum of Highmore become affected, both of these cavities being continuous with the nasal cavity. When they are affected, the headache and pain are very much greater. Sometimes the disease extends into the Eustachian tubes and occasionally also to the ears, thus giving rise to deafness. Several acute diseases, particularly measles, influenza, and typhus fever, are ushered in by symptoms of coryza.

Treatment.— The most efficient measures of treatment are rest, diet, and, when the disease is the result of exposure to cold, vigorous measures for securing activity of the skin, as the wet-sheet pack, the vapor or the Turkish bath. The pain in the forehead when extreme may be relieved by fomentations over the affected part at the same time that the patient is taking a hot foot or sitz bath. If a bath of any kind is taken, it should be at night just before going to bed; or, if taken in the day time, the patient should not go out of doors, or expose himself to drafts, for some hours afterward. It is also important to follow the hot bath with a thorough application of cold water, to tone the skin. The best remedy for a "cold in the head," or a cold which affects the nasal cavities and throat, is the perfection vaporizer, using with it a solution of volatile oils in alcohol (B. C. M. E. W. solution; see Appendix). This remedy should be used every hour. If employed at the beginning, the cold may frequently be cured in twenty-four hours. In case the perfection vaporizer is not at hand, menthol may be used with advantage, in an ordinary steam inhaler. The practice of snuffing cold water into the nose

gives temporary relief, but generally protracts the inflammation. When the attack is drawing near its close, a long walk or ride in the open air is one of the most efficient means of cure. We have often known a long ride on a cold day to cure an acute catarrh at once. This is not, however, the proper remedy to apply at the beginning of the catarrh, but only after the severity of the first attack has subsided.

The susceptibility to colds is best relieved by a course of treatment to harden the skin. The most efficient measure is the frequent use of cool baths, as the cool spray, etc. The liability to colds may be greatly diminished by the employment of oil inunctions. This measure is especially useful after hot baths which cause vigorous action of the skin. A cold should receive prompt attention, as many chronic diseases of the respiratory organs originate in this way. The popular idea that a cold is a matter of small consequence and needs little attention, as the patient will recover without treatment, is an erroneous one, since colds, when left to themselves, nearly always leave the affected part in a more or less diseased condition.

In adult patients, a cold is not at all dangerous in itself, but very young children not infrequently suffer severely and even fatally from its effects. This is especially true of children who are nursing at the breast. The nasal passages being obstructed, it is very difficult for them to take their food in the usual way. In such cases infants should be fed with a spoon. If this precaution is not taken, death will sometimes occur from want of sufficient nourishment.

CHRONIC NASAL CATARRH.

***SYMPTOMS.**—Similar to those of coryza, but less acute; discharge from the nose, either through the nostrils or throat; formation of greenish scales in the nose; mucous membrane swollen, often obstructing breathing; in some cases, diminished secretion constituting "dry catarrh;" often offensive breath.*

Chronic catarrh of the nose is so common a disease in most parts of the world that it scarcely needs description; at any rate, the above symptoms are sufficient to identify the disease.

Cause.—Among the most important may be mentioned "taking cold," a common coryza becoming chronic catarrh from neglect of treatment or by being frequently repeated; errors in diet, especially the use of fats and sugar in excess, and an inactive state of the liver, in part due to their effect upon digestion. An inactive state of the liver is nearly always present in chronic nasal catarrh, which is indi-

cated not only by general symptoms, but by the fact that the discharge from the nose, and especially the crusts which are formed, contain quite a large amount of the peculiar poison which is excreted by the liver, known as *cholesterine.*

Nasal catarrh may continue for many years without greatly impairing the general health, but not infrequently patients subject to it suffer with evidences of a general decline which are properly traced to the long-continued drain upon the system resulting from this disease. The local effects of the disease are at first slight, but after it has continued some time, often become much more serious. The mucous membrane which was at first only swollen and congested, becomes ulcerated. In some cases the ulceration even extends to the bones of the nasal cavity. In these cases the discharge is exceedingly foul-smelling in character, and is often more or less bloody. We have known cases in which the whole interior of the nasal cavity seemed to be in a state bordering on putrescence. Not infrequently the disease of the bony tissues extends so far as to destroy the septum between the nose and the mouth. Still more serious results arise from the extension of the disease to contiguous organs. The disease not infrequently extends upward into the frontal sinus, a cavity in the skull just above and between the eye-brows. In these cases there is persistant dull aching in this part of the head. Sometimes it extends to the cavity known as the antrum of Highmore, and produces dull, aching pain in this part. Frequently the catarrhal disease extends into the Eustachian canals, which communicate with the ears, and by extending upward reaches the ear-drum, or tympanum, which thus becomes the seat of chronic catarrh, one of the most common of all causes of deafness. When the disease extends downward from the nasal cavity, the patient suffers with chronic sore throat, or pharyngitis. As the disease progresses in a downward direction, catarrh of the larynx, or laryngitis, and finally bronchial catarrh, or bronchitis, and in some cases even consumption, are produced. We have met with many cases of consumption in which the history of the case clearly showed that it began with catarrh of the nasal cavity.

Treatment.—Notwithstanding the trivial importance usually attached to this disease, we believe it to be one of much greater gravity than might be supposed from the immediate results. Many people suffer from the disease for years, failing to give the matter sufficient

attention to secure recovery. When of very long standing, the disease is somewhat obstinate to cure, and yet we have been able to demonstrate many times in the course of our experience that it is really curable. The measures to be employed are chiefly the following:—

Careful regulation of the diet, all articles of food being avoided which have a tendency to diminish the activity of the liver. As in nearly all cases of catarrh there is chronic torpidity of the liver, it is important that the patient should carefully follow all the directions given for the treatment of that disease with reference to diet as well as other particulars. Butter, sugar, fats, condiments, excess of animal food, and excess of food of any kind, should be particularly avoided. The patient should drink freely of pure water, and live in the open air and sunshine as much as possible, taking an abundance of out-of-door exercise every day. Especial attention should be given to the clothing, which should be carefully adapted to changes in the weather from day to day. The body should always be clothed warmly. Care should be taken to prevent exposure to drafts or any other means which will produce liability to cold. Baths should be employed for the purpose of exciting activity of the skin. Packs, vapor baths, Turkish baths, wet-sheet rubs, and in fact almost every form of general bath may be employed for this purpose. The application of fomentations over the liver and alternate hot and cold applications to the spine are indicated in connection with general treatment.

These measures are essential when a radical cure is expected, and the employment of local measures alone will accomplish very little unless the predisposing causes of the affection are removed by general treatment. Much good can be accomplished, however, by the use of local measures, among the most useful of which may be mentioned the following:—

The employment of saline solutions in the form of the nasal douche or in some other way. A solution which answers as well as any for this purpose consists of a teaspoonful of salt to a pint of soft water. This solution, as well as others which are employed for the same purpose, may be applied to the affected membrane in any one of three different ways: by injecting it into the nasal cavity through the nostrils by means of the syphon syringe; by washing out the nasal cavity in a similar manner, only injecting the fluid into the back part of the cavity, allowing it to pass out through the nostrils. These methods of treatment have been already fully described elsewhere. The

solution may also be applied to the mucous membrane by snuffing it up into the cavity. A little of the solution is taken up in the hollow of the hand, which is placed to the nostrils, and by forced inhalations a portion can be drawn up in contact with the affected parts.

When there is an offensive odor to the breath arising from the decomposition of catarrhal discharges in the nose or from injury to the bones, a little carbolic acid, twenty to thirty drops to a pint of water, may be added with advantage. In very bad cases in which there is a large amount of secretion, which hardens, forming large scabs in various parts of the nasal cavity, it is often necessary to employ, at least at the beginning of treatment, by means of the post-nasal douche, a large amount of an alkaline solution, the object of which is to dissolve or wash away the hardened secretion. It is generally necessary to use from one to three gallons of the alkaline solution, according to the severity of the case. Ordinary soda or saleratus, in the proportion of a teaspoonful to a quart of water, answers as well for this purpose as anything which can be employed. After the nasal cavity has been thoroughly treated with alkaline washes by means of the syphon syringe, applications should be made of a small quantity of fluid, from half a pint to a pint, containing salt and carbolic acid, or a very small proportion of sulphate of zinc. The proportion of the latter should be about five grains to the pint. Chlorine water, a dram to a pint, permanganate of potash in the proportion of ten grains to a pint of soft water, and other mild disinfectant lotions, may also be employed with benefit. When the catarrh has begun to invade the throat, the inhalation of hot steam by means of the steam inhaler (Figs. 273, 274) will do much to check the progress of the disease.

The extension of the disease to the ear and other parts must of course be treated as may be demanded by the particular case in hand. In some cases no method of treatment seems to work successfully, and the patient apparently derives no benefit from anything except change of climate; but we have never yet met with a case so bad that it could not be benefited by a strict compliance with the rules laid down and a thorough employment of the measures mentioned.

When nasal polypi exist, they must be removed. The snare and the galvano-cautery are the best means of treatment. The Perfection Vaporizer (see Appendix) and the use of antiseptic volatile oils by means of it, afford the best means of treating chronic nasal catarrh. In some instances obstructing growths must be removed by surgical means.

OZENA.

SYMPTOMS.—Stuffiness of the nose; swelling of the membrane; headache; general symptoms of acute or chronic catarrh; ill-smelling discharges, sometimes tinged with blood; formation of scabs in the nose, having a disgusting odor; ulceration of the septum or other parts of the nose.

Cause.—Ozena is generally the result of chronic nasal catarrh or repeated attacks of acute catarrh. It is most likely to occur in gouty or scrofulous subjects. It is very frequently the result of polypus of long standing.

Treatment.—The same measures of treatment as directed for chronic catarrh should be employed for this disease. It will be necessary, however, to give great attention to thorough cleansing of the nostrils, for which the solutions of permanganate of potash and carbolic acid will be found useful. The disease is often very obstinate, and requires long and thorough treatment to effect a cure. The Perfection Vaporizer (see Appendix; B. C. M. E. W. solution) should be used for five minutes, ten or twelve times a day for several weeks.

NOSEBLEED—EPISTAXIS.

SYMPTOMS.—Stoppage of the nose; sensation of pressure in the lower part of the forehead just above the nose; blood flowing from one or both nostrils; sometimes the blood is conveyed into the throat and expectorated instead of proceeding from the nostrils.

Cause.—Hemorrhage from the mucous membrane of the nose is a very frequent result of chronic catarrh in which there is sometimes more or less congestion of the mucous membrane. It also frequently accompanies polypus, especially when ulcers are present. These hemorrhages are of trivial importance, however, and usually stop in a short time of themselves. The most serious cases are those in which there is a morbid tendency to hemorrhage, particularly in persons suffering with hemorrhagic diathesis. The hemorrhage may be excited by some violence, as a blow upon the nose, picking the nose, or thrusting something into it. In persons who have a predisposition to hemorrhage, it may result from eating a hearty meal, drinking tea and coffee or other hot drinks, making violent efforts of any kind, as in running, laughing, or holding the breath. In some persons, hemorrhage from the nose is so easily excited that it is of very frequent occurrence, and is a source of great detriment to the health, and may even shorten life. As a general rule, hemorrhage from the nose be-

comes more obstinate as it is more prolonged, and although the bleeding is not profuse, the patient may suffer great injury on account of the long-continued drain upon the system.

Treatment.—Set the patient upright. Do not allow him to bend forward over a basin of water or anything of the sort. Place to the nose a dry linen handkerchief, pressing the corner of it as far as possible into the nostril from which the blood flows, holding it in place so as to allow a clot to form and close up the bleeding vessels. In the meantime, the patient's arms may be raised above his head, a procedure which will of itself often produce an immediate cessation of bleeding. If the bleeding still continues, throw into the nose with a syringe a strong solution of alum. Tannin and vinegar may be used in the same way. Application of ice to the neck is a very good measure, but bathing the face and snuffing cold water into the nose are measures which rarely accomplish any good. A great amount of good

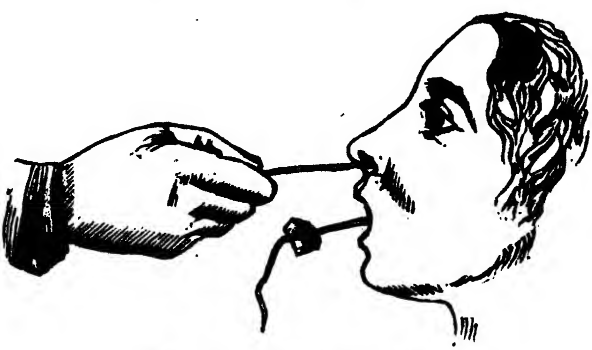


Fig. 306. Plugging the Nose.

may be done by sponging the face with very hot water and snuffing into the nostrils a solution of chlorate of potash, ten grains to the ounce, as hot as can be borne. Hot water itself has a powerful effect to stop hemorrhage, especially when it comes in contact with the fine blood-vessels in the mucous membrane. In extreme cases, the extremities may be ligated so as to withdraw a considerable quantity of blood from the circulation. Care should be taken to warm the extremities, so as to relieve the pressure of blood in the head as much as possible. Some good may be derived from plugging the nostrils with cotton-wool or soft, dry muslin. In the worst cases, however, it becomes necessary to plug the posterior passages from the nose, known as the posterior nares. The best way to do this is quite well shown in Fig. 306. A

strong cord is passed through the nose by means of a gum elastic catheter or something of the kind, and the end is drawn out of the mouth. A plug of muslin or cotton-wool is attached to the cord, and the other end protruding from the nose is pulled upon with sufficient force to bring the plug snugly into place behind the soft palate. This measure rarely fails to accomplish the object for which it is employed. The plug should not be left in place more than forty-eight hours, and a string should be attached to it before it is drawn into position in order to withdraw it, as it must be removed in the same way in which it is applied. Firm pressure on the side of the nose is sometimes effective.

CATARRH OF THE LARYNX—LARYNGITIS.

SYMPTOMS.—ACUTE : *Tickling, burning, or soreness in the throat, aggravated by speaking or talking; painful swelling; voice deeper than natural, hoarse, cracked, perhaps lost altogether; violent cough, easily excited, of a peculiar character, being usually harsh and hoarse; sputum at first scanty and glary or clear; later in the disease the expectoration becomes thicker; in severe cases, interference with respiration, and filling up of the larynx; the latter symptom most likely to occur in children, often mistaken for croup.*

CHRONIC : *Voice permanently impaired, being deepened, coarse, and cracked; occasionally, temporary loss of voice; periodical spasmodic cough; expectoration of yellow, lumpy mucus.*

This disease rarely proves fatal of itself, at least in adults. It is occasionally fatal in children, producing death by suffocation. It is important to distinguish disease of the larynx from pharyngeal disease, as in that affection there is also alteration of the voice, but only in quality, the pitch not being affected. Patients with nasal and pharyngeal catarrh frequently have a nasal or gutteral quality of voice, owing to the contraction of the nasal cavities; but the voice is not deep, hoarse, or cracked. It is also important to distinguish the disease from croup, with which it is very often confounded. The hoarse voice and difficult respiration frequently occur in children suffering from pharyngeal catarrh, but it is by no means so serious an affection as croup. Cases of so-called croup so readily cured by domestic remedies, are really cases of pharyngeal catarrh.

The chronic form of the disease is very obstinate, being subject to frequent exacerbations. Even if the patient recovers, he is very susceptible to new attacks, which occur with such frequency that he can hardly be said to be free from the affection, although the symptoms can usually be made to subside after some little time.

Causes.—The causes of catarrh of the larynx are similar to those

which produce nasal and pharyngeal catarrh. The predisposing causes are general weakness, a stimulating, unwholesome diet, and a disposition to sweat readily, resulting in frequent chilling. The disease may be excited by any one of numerous causes, among which may be mentioned the following: 1. Those which cause local irritation, as breathing cold air, inhalation of dust or irritating vapors, prolonged and loud talking or screaming, and severe coughing. 2. Improper clothing, especially neglect to keep the limbs warmly clad, exposure of the neck, etc. It should be mentioned, however, that more harm is often done by clothing the neck too warmly than by exposing it. Great injury is often done by wearing a woolen comforter about the neck, as it produces perspiration and a relaxed condition of the skin, which renders it unnaturally susceptible to the influence of changes of temperature. 3. Improper diet, particularly the use of condiments and alcoholic liquors, is a frequent cause of laryngeal catarrh. 4. The disease may extend to the larynx from some other part, as from the nasal cavity or pharynx. 5. It may occur in connection with some constitutional disease, as measles or typhus fever. 6. It may be the result of the epidemic form of any fever, when it generally assumes an epidemic form. 7. Catarrh of the larynx is an accompaniment of ulcers and tumors of the larynx, as well as of tuberculous disease of this part.

Treatment.—The most important measures of treatment are those which will prevent the occurrence of the disease. Among these may be mentioned particularly, bathing of the neck and throat with cold water two or three times a day, especially in the months of the year in which the disease is most likely to occur. Careful attention should also be given to the clothing, particularly for the limbs. If the feet become wet by exposure, they should be quickly dried and warmed. It is also important that the diet should be carefully regulated. Condiments and spirituous liquors, as well as fats, sugar, pastry, sweetmeats, preserves, etc., should be carefully avoided, as they have a marked tendency to produce a predisposition to this disease by clogging the liver and deranging the digestive organs. It is also important to call attention to the mistake often made by patients who fear this disease, of protecting themselves too carefully. Over protection is as serious an error as deficient protection. The persons most liable to the disease are those who shut themselves up in-doors most carefully. Wearing thick furs or other clothing about the neck

in cold weather is a very injurious practice, as it causes perspiration and relaxation of the skin of that part, which makes it in the highest degree susceptible to changes of temperature. The neck should be gradually accustomed to cold temperatures, just as are the hands and face, and should be protected only when absolutely necessary. In acute cases, loud or long continued talking or laughing should be forbidden. In some cases, absolute silence must be enforced. The patient should be urged to resist the tendency to cough as much as possible. In the majority of cases it will be found that coughing can be controlled by an effort of the will if the patient has sufficient force of character. Coughing increases the irritation without doing any particular good. The throat can generally be cleared by a slight effort without the prolonged hacking cough in which many patients indulge. No matter if the patient declares that he cannot help coughing, it must be insisted upon that he shall abstain from doing so.

Where the disease is the result of taking cold, the patient should be subjected to such measures of treatment as will secure thorough sweating. The patient may be given a sweating pack, vapor bath, hot-air bath, Turkish or Russian bath. To encourage perspiration, teas of various sorts may be given. Tea made of elder-blossoms is in considerable repute for this purpose; but it is probably not superior to warm water. Fomentations should be applied to the throat, and the patient may also inhale the vapor of water as hot as it can be borne. The most convenient apparatus for this purpose is the form of inhaler we have devised for such cases and used quite extensively in diseases of the larynx, shown in Figs. 273, 274. Alternate hot and cold applications to the throat are also beneficial. Mustard plasters and stimulating poultices are sometimes used, but we have never found them necessary. The diet of the patient should be carefully regulated. He should avoid butter, pastry, fat meats, etc. He should also abstain from the use of sugar and sweetmeats of any kind. The more closely he restricts himself to a diet of grains and fruits, preferably those of an acid character, the more favorable opportunity he has for making a good recovery.

In a chronic case of laryngitis, it is necessary for the patient to give the most scrupulous attention to his diet for a long time. In the majority of cases it will also be necessary to treat the patient for functional diseases of the liver and stomach, which almost always accompany diseases of the larynx. Sometimes change of climate is

necessary, but we believe that the majority of cases can be cured by a careful regulation of the regimen. Tonic measures should be adopted for the improvement of the general health, such as the application of electricity, massage, and inunctions, together with such baths as will secure activity of the skin, applied not so frequently as to produce any degree of prostration. Local treatment by means of the inhaling apparatus is invaluable in catarrh of the larynx as well as pharyngeal catarrh. For vapor inhalation, nothing is better than tincture of gum benzoin, in the proportion of ten drops to the ounce of water, using the inhaler shown in Fig. 274. We have used this remedy a great deal in cases of this kind, and have found that good results were obtained from its use, though we have never been able to ascertain with certainty that any better effects were obtained when the drug was used than when the patient was treated with pure steam. Atomized fluids are of real value in these cases, the best solutions for inhalations being common salt in the proportion of ten to twenty grains to the ounce of water, and alum, five to ten grains to the ounce.

To allay the paroxysms of coughing and difficulty of breathing which not infrequently occur in both the acute and chronic form of the disease, the best of all remedies is the application of a sponge dipped in hot water to the throat, repeated until the skin is considerably reddened. The patient should be allowed to drink freely of hot water or hot lemonade at the same time. In cases of children suffering from the disease, the drinking of an abundance of liquid is particularly important. The child should be prevented from sleeping soundly, and should be frequently awakened and made to drink freely of warm or hot water. The use of hot drinks or hot water applied by a sponge is very strongly recommended by Niemeyer. The most effective means of treating cases of this sort is the Perfection Vaporizer. A variety of volatile and non-volatile remedies may be used with this instrument, which are fully described in the Appendix, together with a number of excellent solutions suited to different cases and different forms of the disease. Use several times daily.

CROUP.

***SYMPTOMS.**—At first, those of a slight cold or catarrh,—slight fever, hoarseness, cough, running at the nose; after a few hours, fits of coughing, increased hoarseness, and harassed respiration, spasm of the muscles of the throat; characteristic symptoms now appear,—brassy, ringing, or barking cough, accompanied with a crowing sound, increased*

fever, embarrassment of the respiration, irregularity of the pulse, features expressive of distress, patient worse at night and better toward morning; in fatal cases, drowsiness increases, breathing becomes more embarrassed, lungs congested, skin covered with cold sweat; finally, coma, asphyxia, and death.

Causes.— The causes of croup are not thoroughly understood. Many physicians now believe it to be identical with diphtheria. It is well known that in many cases, at least, croup is contagious, and hence should be treated as a contagious malady like diphtheria, scarlet fever, or small-pox. It occurs most frequently in children from two to six years of age, more often in boys than in girls. The disease is characterized by the formation of a false membrane in the larynx and trachea. It sometimes also affects the pharynx. The danger to life is from suffocation.

Treatment.—The old treatment, by applying antimony, mercury, and blisters, was in the highest degree unsuccessful. According to Tanner, one-half the persons treated by this plan died. The disease is a very severe one and sometimes difficult to manage, but with proper treatment from the first, few cases will prove fatal.

Apply hot water to the throat by means of sponges or flannels wrung out in hot water as directed for acute catarrh of the larynx. If relief is not quickly secured, exchange the hot applications for cold ones, and if some relief is obtained, keep the cold constantly applied. If necessary, employ ice compresses. This measure must be employed thoroughly to be of any value whatever. Used early in the disease, it may prevent the formation of the false membrane. If it is not employed early enough or with sufficient thoroughness to accomplish this, measures must be employed to secure an early separation of the false membrane from the mucous membrane of the larynx. For this purpose hot and cold applications should be applied to the throat, and the patient should be made to inhale the vapor of hot water, as hot as it can be borne and as large a portion at a time as possible. The vapor may be inhaled through the apparatus for the purpose, represented in Fig. 274, or from a tea-kettle or tea-pot. A paper cone may be arranged in such a way as to conduct the steam to the patient's mouth. A very excellent method of generating steam for this purpose is to slake lime in a tea-pot, and have the patient inhale the vapor through the nozzle. We have used this method on several occasions with complete success. The vapor of warm vinegar is also sometimes useful. Among the most serviceable remedies for causing sep-

aration of the false membrane may be mentioned lime-water, vinegar, and a strong solution of chlorate of potash taken by means of an atomizer. The chlorate of potash solution should be hot when taken, and the patient should inhale it a large part of the time.

It is of the greatest importance that the temperature of the room in which the patient is placed should be carefully regulated. The air should also be kept thoroughly saturated with moisture by boiling water or by means of slaking lime. The latter method has been frequently employed with success, the lime being placed in a tub near the center of the room or near the patient, and water applied to it. Sponging of the hands, feet, arms, and limbs is also recommended for this disease.

If the patient becomes so greatly exhausted that he loses the ability to cough, although the membrane may be separated sufficiently to allow expectoration, means should be adopted to restore the patient as much as possible. Dr. Niemeyer recommends placing the patient in a warm bath and pouring cold water on his head, the back of the neck, or spine, for the purpose of exciting increased nervous activity, particularly to excite cough, thus enabling the patient to throw out the loosened membrane. In case all other measures fail, and suffocation seems impending, as shown by increased difficulty in breathing, blueness of the skin, etc., the surgical operation of laryngotomy or tracheotomy should be performed. This consists in making an opening into the larynx or trachea and passing in a silver tube through which the patient can breathe. Life has many times been saved in this manner.

ŒDEMA OF THE GLOTTIS.

SYMPTOMS.—Hoarseness, rapidly increasing until the voice is lost; harsh, barking cough; inspiration laborious, long-drawn, and whistling; expiration short, easy, and generally inaudible, though sometimes noisy; patient complains of "something in the throat;" other symptoms similar to those of croup.

This is a condition in which the tissues about the epiglottis and upper part of the larynx become the seat of a watery swelling similar to that which often affects the feet, ankles, and lower eyelids. If the finger is passed into the throat, two hard swellings, sometimes as large as a pigeon's egg, may be felt at the root of the tongue; and when the patient attempts to fill the lungs, these swellings are drawn together, and close the opening at the top of the larynx so that inspiration be-

comes extremely difficult. They may sometimes be seen by making the patient open the mouth wide and pressing the tongue. The disease occurs most commonly in adults, in which respect it differs from croup, which is most frequent in children. The principal exciting causes are acute catarrh, laryngitis, erysipelas of the face, and occasionally small-pox, consumption of the throat, and Bright's disease.

Treatment.—The old prescription for this disease reads about like this: "Blood-letting, leeches in large numbers to the throat, emetics, cathartics, etc.;" but we believe with Niemeyer that such treatment is worse than useless in this disease, as well as in croup. According to the learned authority quoted, the local application of ice is of far more value than any of the remedies mentioned. Indeed, we believe this to be by far the best remedy for this disease. The patient should be instructed to hold small pieces of ice in the back part of the mouth, frequently swallowing a small piece. Ice may also be applied externally. We prefer for external application, however, alternate hot and cold applications made with a sponge and a piece of ice. The sponge should be dipped in hot water, slightly pressed, and applied to the throat as hot as the patient can bear, and held in position for a few minutes. It should be followed by rubbing the throat with ice for two or three minutes. This treatment should be used in conjunction with ice internally.

If there is rattling in the throat, and evidence of the presence of considerable mucus, the patient should drink freely of warm water. If possible, enough should be taken to produce nausea and vomiting, as the effort will frequently relieve the embarrassment of breathing. In case other measures fail, a surgeon should be called in to puncture the swollen parts, which will give very speedy relief.

SPASM OF THE GLOTTIS—LARYNGISMUS STRIDULUS.

***SYMPTOMS.**—Interruption of breathing; fingers and toes rigidly contracted; patient struggles for breath; becomes black in the face; suffocation threatens; spasm generally ceases after a few seconds, patient drawing a long breath with a whistling or crowing sound.*

This affection consists in a sudden contraction of the muscles which control the vocal cords, by means of which the narrow opening between the cords, called the glottis, is closed, preventing the entrance of air into the lungs. The disease occurs most frequently in children, particularly in infants nursed with a bottle and most frequently dur-

ing teething. Spasms may occur at intervals of a few hours, days, or weeks. The disease also occurs frequently in adults, especially hysterical females.

Treatment.—To relieve the spasm, apply cold water to the head, face, and chest. Slap sharply the chest and back. Open the mouth of the patient and draw the tongue forward, having the thumb and finger protected by a handkerchief or thin towel. Putting the patient into a hot bath will sometimes give immediate relief. If these measures fail, apply artificial respiration as elsewhere directed. As patients suffering from this disease are likely to become more and more susceptible to it, it is important that such measures should be taken as will remove the liability to this alarming and not infrequently fatal affection. The principal measures for this purpose are proper attention to the diet, which should be very simple, abundance of exercise in the open air and sunshine, frequent bathing, etc. In teething children, it is often necessary to lance the gums. This should always be done when the gums are tender and swollen.

THROAT CONSUMPTION—LARYNGEAL TUBERCULOSIS.

SYMPTOMS.—Chiefly those of acute and chronic laryngitis; in addition, shortness of breath; hectic fever; emaciation and general debility; pulmonary consumption.

This disease most often occurs in the later stages of pulmonary tuberculosis, or consumption. It occasionally occurs as an independent disease. Its causes are essentially the same as those which are elsewhere described as productive of tubercular disease of the lungs. The disease can be readily distinguished from other affections of the larynx, by examination of the expectorated matter for the bacillus tuberculosis.

Treatment.—The treatment is essentially the same as that recommended for chronic catarrh of the larynx. Little can be hoped for, as the disease is almost always fatal. However, much can be done to palliate the sufferings of the patient. Drinking a glass of hot milk early in the morning will frequently relieve the harassing morning cough to a considerable degree. The patient must be required to abstain as much as possible from "hawking" and coughing, which are exceedingly annoying in this disease. The employment of hot vapor inhalations and chlorate of potash spray are the most useful internal remedies. Local applications to the throat are also of some service. The most important remedy, however, as in tuberculosis of the lungs, is climate. An altitude of 5000 feet is necessary in the majority of cases.

PARALYSIS OF THE GLOTTIS—LOSS OF VOICE—APHONIA.

SYMPTOMS.—Complete or partial loss of voice; in slight cases, only hoarseness or deep monotone voice.

This affection appears in two forms, as the result of functional disease or of some organic affection. The first form is more frequent in women, with whom it is a symptom which frequently accompanies uterine disease. The patient often speaks only in a whisper for a long time, then entirely recovers the voice again. When long continued, it becomes nearly as serious as the graver form of the disease, in which there is some structural derangement. This form is most frequently caused by disease of the larynx, as acute or chronic laryngitis, ulceration of the larynx, pressure upon the nerves which control the part by tumors of some sort, and disease of the brain.

The diagnosis of this affection is made conclusive by occular examination of the larynx by means of a laryngoscope, the use of which is illustrated in Fig. 296. By means of this instrument the skilled operator can inspect the vocal cords, and thus discover whether or not there is a lack of proper motion in the act of breathing or attempting to speak.

Treatment.—For the functional form of the disease, electricity is a valuable local means of treatment. In applying this agent, one pole should be applied over the upper part of the sternum, and the other upon that part of the larynx familiarly known as "Adam's Apple." In some cases a cure has been effected by a single application of electricity, and the patient generally experiences some benefit from the treatment almost immediately.

Alternate hot and cold applications, together with rubbing of the throat with cold water, are also useful. Great attention should be given to the general health and the removal of the local disease, of which this affection is in these cases generally a symptom. In the treatment of the more severe form of the disease, special attention must be given to the particular cause of the disease, by the removal of which the patient will show a marked improvement, although some cases of this affection are of course incurable, it being in these cases the result of causes which cannot be removed.

ACUTE BRONCHITIS.

***SYMPTOMS.**—Shivering, sometimes distinct chill; slight fever; tightness about the chest; cough, at first dry and hard, with expectoration of glary, frothy mucus; afterward, copious yellow sputum; headache; lassitude; coated tongue; little appetite; frequently humming or rattling sounds in the chest.*

This disease frequently accompanies catarrh of the larynx. It is not infrequently that we have nasal catarrh, catarrh of the larynx, and bronchial catarrh combined. A severe attack of this sort is frequently termed catarrhal fever. When there is severe frontal headache, soreness of the limbs, and pain in the joints with tenderness, the patient is frequently said to have catarrhal rheumatic fever. At the beginning of the disease, the patient feels as though his "chest is stopped up," coughs hard and expectorates but little, as the secretion is scanty. After a few hours or days, the secretion becomes much more abundant and is expectorated easily, and the cough is said to be "loose." The causes of this affection are precisely the same as those which cause catarrh of the larynx, hence we need not recapitulate them here.

Treatment.—The treatment for this disease should be precisely the same as that recommended for acute catarrh of the larynx, with the exception that the local treatment should be administered to the whole chest and not to the throat alone. Great advantage will be derived from the frequent or continuous inhalation of warm vapor and the constant wearing of warm, moist compresses on the chest during the intervals of treatment.

No measures of general treatment will at all compare with those which excite vigorous action of the skin, as the warm blanket pack, the wet sheet pack, and the Turkish, Russian, or vapor baths.

The diet should be restricted to very simple, unstimulating food, such as fruits and grains, and should also be limited in quantity. Decided benefit may be derived in the majority of cases by drinking very freely of warm mucilaginous drinks. A number of glasses, six to ten, should be taken during the day.

A dry, cold, atmosphere should be avoided in the winter time. The patient should remain in-doors most of the time, so as to secure a uniform, warm, moist atmosphere. This measure must not be carried to excess, however; and while the patient is confined, care should be taken to secure for him proper exercise by means of calisthenics, med-

ical gymnastics, etc., together with massage and an abundance of fresh, pure air. The employment of expectorants and the hundreds of familiar remedies which are recommended as "sure cures" for a "cold," in the majority of cases do no good, but positive harm. In case expectoration is exceedingly profuse, it may often be diminished somewhat by inhalation, by means of the Perfection Vaporizer, using the B. C. M. E. W. and creosote solutions (see Appendix).

In young children suffering from the disease, the lungs are likely to be choked with the expectoration, on account of the inability to remove it by coughing. If the evidence of accumulation is very great, it may be necessary to employ a mild emetic to induce vomiting, by which means the accumulated mucus may be dislodged. This may frequently be done also by causing the child to cry violently by placing it in a cold bath, rubbing the feet with a brush, or some similar means.

CAPILLARY BRONCHITIS.

SYMPTOMS.—Those of acute bronchitis, to which are added great frequency and difficulty of breathing; if the patient can talk, speech is short and jerky; nostrils dilated at each breath; face swollen and congested; countenance indicating great distress; great restlessness; more frequent pulse, cough ineffectual; rattling in the chest.

This form of bronchitis most frequently occurs in children. It affects the smaller bronchial tubes, not the smallest, and is much more dangerous than the preceding on this account. In very young children it is a fatal disease, as the bronchial tubes are so small in infants that they become easily obstructed, which occasions collapse.

Treatment.—The ordinary methods of treating this disease are by no means successful. The most useful recommendation found in the text-books is to avoid any weakening measures, and to endeavor to maintain the patient until nature can have time to effect a cure. In the treatment of a number of cases of this disease, we have become satisfied that much can be done to facilitate recovery if thorough and prompt measures are taken at the outset. As soon as the nature of the difficulty is discovered, the patient should be given a blanket pack so as to induce free perspiration. This will almost invariably bring marked relief to the most urgent symptoms, and it should be repeated as often as necessary—as frequently as two or three times a day if demanded by the urgency of the symptoms. This measure, together with the inhalation of steam, will often effect almost marvelous re-

sults. If the patient is too young to use the inhaler, the atmosphere of the room should be kept warm, not less than 75°, and the atmosphere should be kept moist by boiling water in a large iron kettle on the stove, or by slaking lime. Care should also be taken to secure an abundance of fresh air. After recovery from an acute attack, fortify the skin against cold by daily cool sponge baths.

CHRONIC BRONCHITIS.

SYMPTOMS.—Habitual cough; shortness of breath; copious expectoration; symptoms of acute bronchitis, with less intensity.

The causes of chronic bronchitis are essentially the same as those of the acute variety. In fact, it is most commonly produced by the frequent occurrence of acute bronchial catarrh. It is always associated with an inactive condition of the liver and with more or less impairment of the digestion. When it continues a long time, there is usually more or less debility. In consequence of the obstruction, the small bronchial tubes become greatly dilated. This affection is known as emphysema. When it is present, the patient suffers much from labored breathing, the chest is generally enlarged, and the space between the ribs is abnormally depressed.

Chronic bronchitis is seldom a direct cause of death, but may lead to a fatal result by producing other diseases. It is often mistaken by unskilled persons for consumption, a much more grave disease; but a careful examination will show the absence of the symptoms characteristic of the latter disease.

Treatment.—The first attention should be given to the diet, which should be wholly unstimulating in character, consisting chiefly of farinaceous articles of food. Eggs and milk may also be allowed, and when the digestive organs are somewhat enfeebled, especially if the patient is troubled with acid or flatulent dyspepsia, fish and meat in moderate quantities need not be interdicted. Many patients suffering with emphysema are given great inconvenience by gas in the stomach and bowels. Such persons should avoid the use of vegetables, sweets of all kinds, tea and coffee, and all kinds of alcoholic drinks. Silk or woolen should be worn next to the skin. The patient should be careful to protect himself against changes of temperature, and should dress sufficiently warm to keep the skin active. The measures of treatment indicated are such as will increase the activity of the skin, as the pack, inunction, rubbing wet-sheet, hot-air bath, and Turkish bath. After

each bath, especially in the cold season of the year, an inunction of purified cócoa-nut oil, vaseline, or some other unguent, should be employed to prevent taking cold. The patient should spend as much of his time in the open air as possible, engaging in gentle exercise.

For local treatment, no measure is of more value than the inhalation of hot vapor and the spray of hot water. When expectoration is excessively copious, inhalation of vapor of tar may be employed, as already directed (page 806), or the patient may inhale the spray produced by the atomizer from weak solutions of lime or tannin. When the patient is troubled with a dry, harassing cough, relief will almost certainly be afforded by the inhalation of hot vapor. Daily fomentations should also be applied over the chest. These applications should be followed by sponging the chest with cold water to tone up the relaxed skin.

As an inactive condition of the liver is very common in this disease, it should receive such attention as has been already directed for that condition.

In some cases, it will be necessary to make a change of climate, although the benefits derived from this measure are not always as great as are supposed. Probably one of the greatest advances made in the treatment of emphysema, which is one of the most serious results of this affection, is what is known as the "pneumatic" treatment. This mode of treatment has been elsewhere described. (See page 681.) We have long employed this treatment for this class of cases, employing Waldenberg's apparatus, constructed for us by Reynders, of New York, and have observed good results. We have under treatment at present a number of patients suffering with the disease in different stages, for whom we hope to obtain a marked degree of benefit in due time by this mode of treatment.

The "grape cure" has been very strongly recommended for chronic bronchial catarrh, and has been employed very successfully, especially in cases in which there is a scanty and tenacious secretion expectorated by violent coughing. It is probable that in cases of this kind the cure is not due to any specific principle in the grape, but from the simple diet and the taking of large quantities of fluid.

Patients suffering with emphysema should exercise great care to avoid severe coughing, and should always restrict the tendency to cough as much as possible, as violent efforts increase the irritation and aggravate the difficulty. The employment of narcotics in allaying

cough in the different forms of bronchitis is often productive of bad results. In the chronic form of the disease the patient soon becomes so dependent on the narcotic, the dose of which must be very rapidly increased, that before he is aware of it he finds himself in the unhappy position of an habitual opium-taker. The best authorities also deprecate the employment of expectorants. The Perfection Vaporizer (see Appendix; B. C. M. E. W. and creosote solution) should be used several times daily. In chronic cases a dry climate is essential for a cure.

WINTER COUGH.

This is a mild form of chronic bronchitis which affects the patient only in winter. It is, in fact, the precursor of the more formidable disease. At first the cough is confined to the winter, but each year, if efficient curative measures are not employed, the disease encroaches more and more upon the warm season, until finally the cough becomes continuous both summer and winter. The patient is now suffering from chronic bronchitis, or chronic bronchial catarrh.

Treatment.— The treatment for winter cough is the same as that recommended for chronic bronchitis. For tightness in the chest, nothing will give so prompt relief as a hot fomentation at night followed by inhalation of the vapor of hot water, and a moist compress to be worn upon the chest during the night. Dry friction of the skin, cool saline sponge baths, and oil rubbings are important.

BRONCHIAL CROUP, OR CROUPOUS BRONCHITIS.

SYMPTOMS.—Expectoration of casts of bronchial tubes; dry cough; bleeding from lungs; some difficulty in breathing; often begins with chill, followed by fever and pain in side; may be acute or chronic.

This is a rare disease. Bronchial croup may occur from extension of the disease from the larynx into the large bronchi, or from the air-cells into the small bronchial tubes; but in this affection the croupous process is confined to the bronchial tubes, usually those of moderate size. The disease is sometimes acute, but is more often chronic, existing for years, in many cases the patient coughing up daily, or at longer intervals, casts of some portions of the air-passages.

Treatment.—This disease must be treated upon the same general plan recommended for croup of the larynx. Careful attention to the

general health, and the daily employment of hot and cold applications to the chest, and inhalations of hot vapor, will accomplish more than any other remedies.

ASTHMA.

SYMPTOMS.—Patient suddenly attacked, or after premonitions of headache, sleepiness, etc., or an attack of indigestion; great difficulty of breathing; chest becomes distended, since the air cannot be easily forced out of the lungs after inhalation; loud wheezings or whistlings heard with each breath; sense of constriction about chest; pulse feeble; lips purple; eyes staring; attacks most likely to occur in the night, often being periodical.

This disease is often confounded with others in which there is difficulty in breathing, as in disease of the heart, other affections of the lungs, etc. Asthma proper is a purely nervous disease. It consists in a muscular contraction of the smallest bronchial tubes, those next the air-cells, by which the air is prevented from passing out of the cells after it has been breathed in. The patient complains of inability to "get his breath out," notwithstanding efforts so vigorous that he is bathed with perspiration. In fact, the more severe the effort, the less effectual, in the majority of cases, as the difficulty is aggravated by the attempt to overcome it. Asthmatic attacks sometimes occur periodically, without any apparent exciting cause; but in most cases there is some cause to which each particular attack is attributed by the patient. The most common causes are excessive muscular exertion, taking cold, inhalation of sulphurous fumes, or of some other irritating substance, as dust from the sweeping of carpets, etc. The emanations from feathers is not infrequently the cause of asthmatic seizures. Many persons have suffered for years in consequence of sleeping on feather beds or pillows, being wholly ignorant of the real cause. This disease is often tolerated for years, rarely causing death, but ultimately undermines the patient's health. Chronic sufferers from asthma are usually thin, sallow, and hollow-cheeked. In the great majority of cases, asthma is connected with some other serious disease; as chronic bronchitis, emphysema, dyspepsia, disease of the liver, and, in females, disease of the uterus. Polypi or other disease of the nose is a frequent cause.

Treatment.—When the attack is occasioned by indigestion, and there is undigested food in the stomach, give the patient an emetic of warm water at once. Small bits of ice swallowed, or a cup of strong coffee, will often give relief. Give the patient plenty of fresh air, but be careful to avoid chilling. A remedy very successful in many cases is

the hot sitz bath accompanied by fomentations to the chest and cold applications to the spine. Electricity is also a very useful agent. In some cases, we have obtained relief by the use of this agent when all others failed. A remedy very strongly recommended by a physician who is himself a sufferer from asthma is the following: Breathe out slowly and wait after the lungs are emptied as long as possible; then fill the lungs and hold the breath as long as possible. Repeat the process several times. Nitre paper, made by soaking blotting-paper in a solution of saltpeter and drying, when burned, gives off fumes, the inhalation of which gives almost magical relief. The most effective of all measures of treatment, however, is the inhalation of compressed air and exhalation into rarefied air by means of a pneumatic apparatus. The most of these measures are simply palliative. In order to cure the disease, the real cause must be ascertained and removed. Every attention must be given to the general health and to the special morbid conditions which may be suspected of being a cause of the difficulty. The patient must avoid all the known exciting causes. A pure, dry atmosphere should be sought; but the same climate is not best for all patients. Wind, dampness, dust, and smoke must be sedulously avoided. Fomentations over the liver two or three times a week, the moist abdominal bandage, worn nights, and sufficient eliminative treatment to secure activity of the skin, such as packs, Turkish, or hot air baths, followed by a cold shower or spray, are measures of real value in the treatment of this disease. The inhalation of the vapor of turpentine is a means which should not be forgotten.

SPASM OF THE DIAPHRAGM.

SYMPTOMS.—Breathing very difficult and slow, expiration twice as long as inspiration; abdominal muscles hard; face blue; no wheezing or whistling.

This is a peculiar form of asthma in which there is a rigid contraction of the diaphragm. The patient is troubled greatly to expel the air from his lungs.

Treatment.—The same remedies recommended for ordinary asthma should be applied. The hot bath, fomentations to the chest, and ice compresses to the spine will be found particularly serviceable. In severe cases, chloroform is sometimes required to relieve the spasm.

HAY ASTHMA, OR HAY FEVER.

***SYMPTOMS.**—Usually begins with weakness, coated tongue, diarrhea, alternating with constipation, general debility, and sleeplessness; sometimes begins suddenly; tickling in the nose; coryza; prolonged and violent sneezing; swelling and redness of the eyes, with evidences of acute mucous inflammation; tickling in the throat, with dryness or slight burning; sometimes slight deafness; bronchial catarrh; great difficulty in breathing, with tightness about the chest and croupy symptoms; attacks most frequent in daytime, instead of night as in nervous asthma; sometimes frequent chills followed by considerable fever.*

This curious disease has been very closely studied for a number of years, and yet its cause is, at present, still somewhat obscure. It has been believed by many eminent physicians that the disease is caused by the pollen of plants or grasses, and experiments conducted by an eminent German physician seem to confirm the view; but it has not been determined what particular plants furnish the noxious pollen. Attention has been specially called to the rag-weed, a very common plant almost everywhere, as it has been observed that the occurrence of the disease in a large number of persons is simultaneous with the flowering of this plant. We have frequently been told by patients that they believed this to be the cause of the disease in their particular cases at least. On the other hand, there are those who hold the disease to be chiefly a nervous disorder. Our friend, the late Dr. Beard, of New York, collated a large number of facts upon this subject which seem to show beyond any room for doubt that one of the essential causes of the disease is individual idiosyncrasy. The exciting cause is probably different in individual cases, which accounts for the fact that different persons are affected at different seasons of the year. The disease usually lasts from four to six weeks, and leaves the patient almost as suddenly as it appears, in some instances observing in its departure the very same regularity, even to the hour, as is observed in its commencement. The disease is most common in persons suffering from nasal catarrh.

Treatment.—The author of the article on hay fever in Ziemssen's Cyclopedia of Medicine says, "Treatment is still powerless against hay fever." It has long been considered as settled that drugs are of no value in the treatment of this affection. We have found, however, that by the employment of Turkish, vapor, Russian, and similar baths, the patient's sufferings may be very greatly mitigated, more than by any other means. For several years we have annually had a number of

these cases under treatment, and have found that in nearly every case the disease can be mitigated by the treatment named. In most cases the patient is very greatly relieved while in the bath, and the relief continues for some time after. If care is taken in the interval of treatment to avoid exposure to the cause of the malady, in nearly all cases the attack can be greatly lessened in severity, much shortened, and, in some cases, broken up altogether. The employment of the hot-vapor inhalation is another remedy of great value in cases in which the asthmatic symptoms are prominent. Hot and cold applications to the spine are also useful in some cases. In many persons the real disease is aggravated by taking cold. Creosote and cocaine afford some relief, but a change of climate is the most reliable measure.

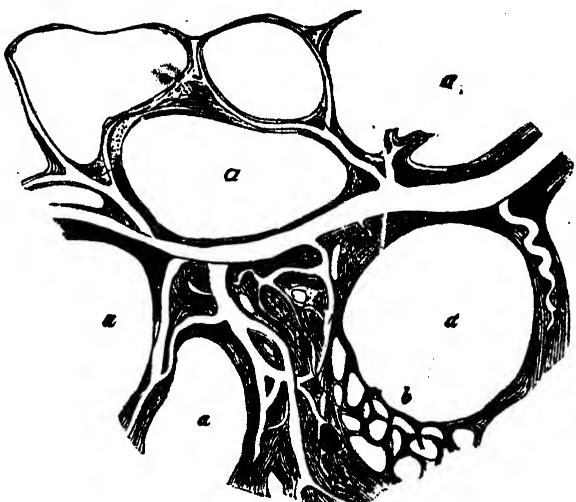


Fig. 307. A magnified portion of Lung affected by Emphysema.
a. Greatly dilated air-cells; *b.* Cells of natural size (Bennett).

EMPHYSEMA.

SYMPTOMS.—Weak cough; frothy or heavy yellow expectoration; shortness of breath on making any exertion; voice weak; complexion dusky or bluish; asthmatic attacks; weak pulse; digestion slow; bowels constipated; chest barrel-shaped; slight chest movement in breathing; symptoms of bronchitis.

Pulmonary emphysema consists in an enlargement of the air-cells. In consequence of the abnormal thinning of the walls of the cells, many capillary vessels become atrophied, so that the blood is not suf-

ficiently aerated, and the system receives an insufficient supply of oxygen. This difficulty is greatly increased by the inability of the lungs to empty themselves, a portion of the impure air charged with carbonic acid gas remaining in the dilated cells, thus preventing the proper purification of the blood. It is the accumulation of this poison in the blood that occasions the blueness of the skin of the face and other parts. The obstruction to the circulation of blood through the lungs occasions congestion of the stomach, liver, and other abdominal organs. Hemorrhoids result in some cases. Out of these remote effects of the affection grow many of the most serious results which accompany its long continuance. The condition of the lungs in this disease is shown in Fig. 307.

The causes of emphysema are pleurisy, producing adhesions; chronic bronchial catarrh, or bronchitis; violent coughing, as in whooping-cough and dry bronchial catarrh; lifting heavy weights; playing upon wind instruments in an injudicious manner, and similar causes.

Treatment.—If the disease is the result of, or is accompanied by, bronchial catarrh, this must receive such treatment as has been already

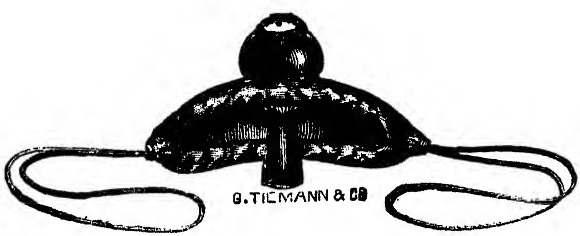


Fig. 308. Dobell's Residual Air-Pump, for use in Emphysema.

prescribed for that disease. The patient must avoid exposure to cold. A uniform temperature is very necessary, as emphysematous patients take cold very easily. Flannel should be worn constantly. Warm packs, water and vapor baths are of great utility. Massage and inunction are also very useful remedies. To relieve the asthma which accompanies this disease, the use of the pneumatic apparatus is of greatest service. (See Fig. 217.) This is also the most serviceable of all means of treatment for effecting a radical cure in the few cases in which this can be accomplished. By causing the patient to breathe into rarefied air, the distended air-cells can be emptied of their contents, and somewhat contracted. By a continued daily use of this remedy, more has been accomplished than by any other means. This

treatment is employed very extensively in France and Germany, and has lately been introduced into this country. Many years ago we had an apparatus constructed for the purpose of administering the pneumatic treatment, and the results obtained have been thus far very satisfactory. In Fig. 308 is shown a form of respirator so constructed that the same effect obtained by exhalation into rarefied air with the pneumatic apparatus can be obtained in very small degree. Patients suffering with emphysema should avoid coughing as much as possible, as it aggravates the disease. They should also wear some form of respirator whenever exposed to cool air. (See Fig. 309.) The diet is of great importance. All kinds of food which have a tendency to form gas (see "Flatulent Dyspepsia," p. 933) must be carefully avoided. Fats, sugar, and everything clogging to the liver must be carefully avoided also. Most patients will be decidedly benefited by restriction to two meals a day.

Fig. 309. Respirator.

COLLAPSE OF LUNGS.

SYMPTOMS.—Shallow breathing; shortness of breath; blueness of the countenance, due to deficient aeration of the blood; in chronic cases the pulse becomes small, complexion pale, urine scanty.

Collapse of the lungs is most frequent in newly born children. In adults it is most often the result of capillary bronchitis, measles, disease of the heart, dropsy of the chest or abdomen, air in the chest, or pneumo-thorax, and narrowing of the chest by deformities of the spine. Compression of the lungs, causing collapse, is the cause of shortness of breath in hunchbacks and the usual early death of such persons.

Treatment.—With the exception of cases of very young children, this affection can be intelligently managed only by treating the disease of which it is the result. The treatment required in most cases is the same as that recommended for capillary bronchitis. In cases of compression from dropsy, tapping or removal of the fluid by aspiration, is generally required.

CONGESTION OF THE LUNGS.

SYMPTOMS.—Fullness or constriction of the chest; shortness of breath; dry, hacking cough, sometimes accompanied with frothy expectoration, occasionally streaked with blood; in severe cases, great difficulty in breathing; very rapid respiratory efforts, choking sensation, cough, with copious expectoration of bloody, frothy sputum; face red at first, grows paler as patient becomes exhausted, drowsy, and finally dies, if not relieved. In passive congestion, greater shortness of breath, especially on exercising.

This is a very common affection, though not often recognized as a distinct disease. Mild cases are considered—and correctly in many cases—to be incipient consumption, and severe ones are called pulmonary apoplexy. There are two forms of the disease: 1. Active congestion, in which too much blood circulates through the lungs, and 2. Passive congestion, in which there is too much blood retained in the lungs from some obstruction to the pulmonary circulation. The symptoms of the two diseases are very similar, it being sometimes impossible to distinguish between them in an individual case, except by observing the causes and inducing circumstances.

Causes.—The causes of active congestion are as follows: 1. Increased action of the heart, most often noticed in young persons, particularly about the age of puberty, and in narrow chested young persons troubled with palpitation of the heart. This may be induced by excessive exercise, the use of tea, coffee, alcoholic drinks, smoking, and great mental excitement of any sort, as from rage, delirium, etc. There is good reason for believing that this condition in young persons leads to pulmonary consumption when not corrected. It may often be considered, indeed, as the incipient stage of that disease. 2. Exposure of the lungs to cold air. 3. Rarefying of the air in the lungs, as in croup. 4. Disease which disables some part of the lungs, as pneumonia or pneumo-thorax. The chief causes of passive congestion are, 1. Organic disease of the heart, particularly disease affecting the valves of the left side. 2. Feebleness of the heart from general debility, fever, fatty degeneration, or any other cause. This form is very likely to occur in cases of protracted fever when the patient lies long upon the back, from settling of the blood in the lower part of the lungs.

Treatment.—Forbid all foods and drinks of a stimulating character, especially in that form of active congestion seen in narrow-chested young persons, and which is very likely to result in consumption. Tea, coffee, and hot drinks of all kinds, as well as all alcoholic drinks, stimulating condiments, flesh diet, and indeed everything of an

exciting nature must be strictly avoided. The diet should consist chiefly of fruits and grains. Milk may be used freely in place of meat and eggs. The "grape cure" practiced at Meran on Lake Geneva in Switzerland, is wonderfully successful. The patient lives on grapes, eating several pounds a day. The milk and whey cure are also practiced successfully in these cases. In the cases of violent congestion usually termed pulmonary apoplexy, the usual remedy is bleeding. We have treated a number of cases of this disease without this measure, however, and with such excellent results as warrant the assertion that it is not required. In one case in which the patient expected to die any moment, and was expectorating large quantities of bloody, frothy sputum, the heart beating very violently, almost instantaneous relief was obtained by the use of faradization, the positive pole being applied at the base of the brain and the negative over the lungs. The same patient was relieved in a similar manner in several subsequent attacks. In other cases, the warm full bath has been equally effective, relieving the lungs by attracting the blood to the surface. To prevent congestion arising from long illness with confinement in bed, change the position of the patient often, and thus prevent settling of the blood in dependent parts of the lungs. In congestion arising from pneumonia or other disease of the opposite lung, relief will be obtained only by cure of the primary disease. Fortunately, the same remedies that relieve the one, also affect favorably the other. Bleeding, especially in such cases as these, is an almost fatal mistake, since it will only temporarily relieve the urgent symptoms, and will certainly aggravate the main disease. The same remark applies with still greater force to congestion arising from disease of the heart. In these cases, great care should be taken to warm the extremities and in every possible way promote the circulation in the surface. Fomentations to the chest, applied as hot as can be borne for a short time, and ice-compresses between the shoulders, is an excellent measure which almost always gives relief. If amelioration of the symptoms is not otherwise obtained, we may relieve the lungs by the use of Junod's boot; or, in the absence of this, by tying a ligature around one or both limbs near the body with sufficient tightness to obstruct the venous circulation and cause an accumulation of blood in the limbs. This measure is really equivalent to the abstraction of a considerable quantity of blood, without the dangers of the latter measure. The ligatures should not be kept in place so long as to injure the ligated parts, and should be gradually loosened as soon as the lungs are relieved.

HEMORRHAGE OF THE LUNGS.—HÆMOPTYSIS.

SYMPTOMS.—Blood frothy and coughed up in mouthfuls; blood mingled with phlegm or mucus; blood bright red and fluid, no clots.

The following comparative table of symptoms shows very clearly the difference between hemorrhage from the lungs and bleeding from the stomach, conditions which are often confounded:—

BLEEDING FROM THE LUNGS.	BLEEDING FROM THE STOMACH.
Difficult breathing.	Nausea.
Pain or heat in the chest.	Tenderness at pit of stomach.
Blood frothy.	Blood not frothy.
Blood of bright red color.	Blood of dark color.
Blood mingled with phlegm.	Blood mixed with food.
No clots.	Clots always present.
Blood coughed up in mouthfuls.	Blood vomited freely.
Symptoms relating to the chest.	Symptoms relating to the stomach.

The chief causes of hemorrhage from the lungs are congestion of the lungs, or disease which weakens the walls of the small blood-vessels. Undoubtedly the latter cause is the most common one. Pulmonary hemorrhage occurs most frequently in persons suffering with consumption, either in its incipient or its advanced stages. Bleeding at the lungs must not, however, be taken as positive evidence of the existence of tubercular disease, since many cases are observed in which even a severe hemorrhage from the lungs is not followed by any other symptoms of disease of the lungs, the patient enjoying perfect health for many years. There is good evidence for believing that hemorrhage from the lungs is a cause of consumption, the retained blood giving rise to inflammation, which is followed by breaking down of the lung. Hemorrhage of the lungs occurs with considerable frequency in persons of a scrofulous or tuberculous tendency who seem to be in perfect health; in these cases it is justly regarded as a very ominous indication, and one which demands prompt and vigorous attention.

The bleeding generally occurs from the rupture of a capillary vessel in the mucous membrane of the bronchial tubes, but occasionally in the deeper tissues of the lungs. Death from hemorrhage occurs much more rarely than is generally supposed, even in cases of severe tubercular disease. In fact, some eminent physicians maintain that consumptive patients who have occasional hemorrhages succumb to the disease less rap-

idly than those who do not suffer with hemorrhage at all. Many consumptives express themselves as feeling relieved after a slight hemorrhage, probably owing to the temporary relief of congestion. In cases in which there is very profuse hemorrhage which cannot be controlled by treatment, the bleeding is usually caused by the rupture of a vessel of large size. The expectoration of small quantities of blood, in the form of small streaks or specks in mucus or phlegm, is a symptom of little or no importance. In these cases the source of the slight bleeding is generally in the throat. In some cases, clots of blood collect in the throat at night from slight hemorrhage from the nose.

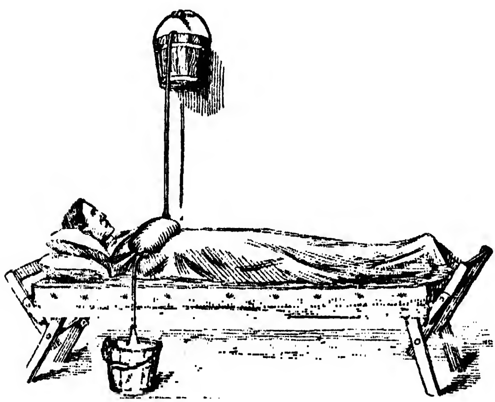


Fig. 310. Applying cold to chest for hemorrhage of lungs.

Treatment.—Rest in bed with the head and shoulders elevated. Mental and physical quiet. Restrain cough as much as possible, as it greatly aggravates the hemorrhage. Give patient iced-water to drink and small bits of ice to swallow. Apply ice compresses over chest, and every fifteen minutes make hot applications between the shoulders by means of hot bricks, fomentations, or hot bags. Take care to keep the trunk and limbs dry, and apply heat to the extremities. Frozen compresses may be applied thus: Mix, in an ordinary large milk-pan, equal parts of pounded ice and salt at least two inches deep. Mix quickly and cover. Place the pan upon a compress of cotton or linen of four or five thicknesses wrung out of iced-water as dry as possible. In a few seconds the compress will be frozen. Apply at once, and cover with a dry flannel A good means of applying continuous cold is by means of the syphon syringe, as shown in Fig. 310. The upper vessel is filled with water containing two or three pounds of salt to the gallon, and a quantity of ice. The current of the ice-cold mixture is started by means of the tabs upon the sides of the bag, the stop-cock on the lower tube being closed. When the bag is sufficiently full, the stop-cock is opened sufficiently to allow the fluid in the bag to pass out at the same rate that it

runs in. When the water has nearly run out of the upper vessel, that which has run into the lower vessel should be put into the upper one and a new supply of ice, or ice and salt, added. By this means an intense degree of cold may be kept up for hours without wetting the patient or giving him any inconvenience whatever. Good results are also obtained by employing cold enemas. The temperature should be as low as the patient will bear. It is customary to add a little vinegar to the rectal injections, though we think the addition is unnecessary. Common salt is a remedy popularly reputed to be of value in these cases. The usual dose is a teaspoonful of finely-powdered salt taken dry. The most useful internal remedy, however, is the inhalation of a solution of alum or tannin. The proportion should be 5–10 grs. to the ounce of water, and the solution should be inhaled by means of an atomizer. Junod's boot (Fig. 219) and ligation of the limbs are remedies of value in hemorrhage from the lungs as well as in congestion. The diet should be the same as directed for congestion, meat, stimulants, hot drinks, and stimulating condiments being carefully avoided. Little food should be taken during the attack, and for a day or two after. The patient's mind should be quieted by the assurance that, in all probability, he will recover, and it may even be suggested to him that the effect of the hemorrhage may be beneficial.

PULMONARY APOPLEXY.

SYMPTOMS.—Violent hemorrhage from the lungs; or suffocation, due to filling of the lungs with blood; or sudden death from internal hemorrhage. In less severe cases the chief symptoms are sudden difficulty in breathing; cough with expectoration tinged with blood; symptoms of pneumonia or pleurisy; in cases of heart disease, sudden irregularity of the pulse.

This serious affection is the result of the obstruction of a blood-vessel in the lungs, which may arise in consequence of disease of the heart or some other affection which gives rise to clots or small portions of tissue in the circulation. The disease is somewhat obscure, and is sometimes difficult of detection. It is easily mistaken for pneumonia, of which it is sometimes the cause.

Treatment.—Elevate the head and shoulders of the patient. Apply warmth to the extremities. If there is much bleeding, employ the remedies recommended for hemorrhage from the lungs. If the case is a severe one, so that the blood flows faster than it can be expectorated, it will of course prove speedily fatal.

INFLAMMATION OF THE LUNGS.—PNEUMONIA.

There are three forms of pneumonia, *croupous, catarrhal,* and *chronic.* We will first call attention to

CROUPOUS PNEUMONIA—LUNG FEVER.

SYMPTOMS.—Marked chill, followed by fever which rises often very high, even on first day; headache; shortness of breath, patient breathing thirty to fifty times a minute instead of sixteen to twenty times; pain in chest, at the seat of the disease, of a piercing or stabbing character; short, ringing cough; expectoration of rust-colored mucus, which is very tough and tenacious; careful examination of sputa shows casts of small tubes; pulse rapid, ninety to one hundred and fifty; sometimes jaundice; redness of cheek upon the affected side; eruption upon the lips; crackling sound heard upon placing ear to affected side.

The above-named symptoms generally follow one another in succession, with exception of the high pulse, which is present all through the disease. They are sometimes separated into three groups, known as the three stages of the disease. 1. *Engorgement.* In this stage the affected part of the lung is intensely congested with blood, and the air-passages contain a viscid mucus which glues together the walls of the small bronchial tubes, producing a crackling sound when the patient takes a deep breath, which can be easily heard by listening at the point of pain. The latter symptom is always present in this stage, except in very old persons, in whom it is sometimes absent. It is similar to the pain of pleurisy, which is also present at this stage, the covering of the affected portion of the lung participating in the inflammation. 2. *Hepatization.* In this stage the air-cells are filled with a tenacious exudation, which causes the chest to lose its natural resonance. When percussed, the sound obtained is flat or dull. 3. *Resolution or purulent infiltration.* At this stage, the matter in the air-cells is usually liquefied and absorbed—not expectorated as many suppose. In case absorption does not occur, suppuration sometimes takes place, often extending to the lung, even forming cavities of greater or less size. In other cases, the lung remains solidified, and the patient suffers with chronic pneumonia or consumption.

Pneumonia sometimes occurs as a complication of typhoid fever and other acute diseases. It is also sometimes attended by acute catarrh of the stomach and bowels. It is not a very fatal disease in young and healthy subjects, but in weak children, in old persons, and in habitual drinkers, it is a very fatal malady.

Causes.—The exciting causes of the disease are not well understood. It is generally attributed to "taking cold;" but there is some doubt whether this is an important cause of the disease. From an extended study of the subject, Dr. H. B. Baker, Secretary of the State Board of Health of Michigan, has ascertained that pneumonia is most frequent when the temperature and amount of moisture in the air is low, and the amount and force of wind and the proportion of ozone is high. This conclusion he has reached by a comparison of the weekly reports of diseases made to the Board of Health, by its numerous correspondents, with the daily records of the various meteorological observers in various parts of the State. While this kind of investigation is still in its infancy, the results which have already been obtained are exceedingly interesting, and may probably be considered as reliable. Pneumonia occurs at all periods of life, but is most frequent in aged and feeble persons. Its probable cause is a specific germ.

Treatment.—The old-fashioned routine treatment of blood-letting, is now, fortunately, pretty much out of date. The study of the natural history of the disease has recently shown that the great majority of cases of this disease recover with no active treatment, or no treatment other than simple nursing. It has also been observed, and is acknowledged, that patients who are bled are, as a general rule, much less likely to live than those who are not bled, where bleeding is generally practiced. The greatest immediate danger in this disease is the depressing influence of the excessive heat upon the heart; hence in this, as in most other acute diseases characterized by high fever, the most important measures of treatment are those which will reduce the fever. Of these, the cool bath, the graduated bath, the sponge bath, the wet-sheet pack, and the cold enema are the most effective. Cool compresses or ice-bags, alternated every three hours by hot fomentations for ten minutes, should be applied to the chest, particularly to the affected side, the seat of pain. The hot fomentations relieve the pain, and the cold compresses check the diseased process. The compresses should be wrung out of cold water and changed every five to eight minutes, or as often as they become warm. Although the cool compresses are not usually liked by the patient, they will soon give relief if their use is continued, and they do much toward shortening the course of the disease. Care should be taken to keep the patient's body from being wet except where the treatment is applied. The cold compress is much used in the large hospitals of Ger-

many. In the great hospital at Prague, it is considered the main reliance in the treatment of this grave malady. We have used it in conjunction with other measures of treatment in many cases with marked success. When the pulse becomes as rapid as ninety-five to one hundred and ten, or more, cool sponging, the wet-sheet pack, the cool full bath, or the cool enema should be employed. In ordinary cases any one of the first three measures mentioned is usually sufficient, if repeated with proper frequency. When much chilliness is produced by the contact of water with the skin, the cold enema is a most admirably useful measure. It will control the high temperature when other measures fail to accomplish the desired result in many cases. The amount of water required is half a pint to a pint. The temperature may be forty to sixty degrees. The colder the water, and the larger the quantity employed, the greater and more prolonged will be the effect. We consider this one of the most important of all the recent advances in the use of water. Next in importance to the use of water in this disease, is the employment of fresh air. The apartment should be kept as cool as possible without discomfort, and an abundance of fresh air should be continually supplied. Drafts should be avoided; but it is better to have fresh air with drafts, than to sacrifice the pure air for fear of drafts. In case water cannot be applied, the patient may be exposed with the surface unprotected to the cooling effects of the air. It is even admissible to expose the wet surface of the body to the air, allowing the patient to be cooled by evaporation. The danger of taking cold in this disease is by no means so great as supposed. The Perfection Vaporizer is valuable in these cases. Simply hot water, without medication, should be used in the instrument. Use every hour, or as often as necessary for relief of the cough and as an aid to expectoration. In extreme cases, employ oxygen gas.

The diet of the patient should consist of milk, oatmeal gruel, ripe fruit, and similar easily digested food. No meat, eggs, or other stimulating food should be allowed.

Discontinue the cold treatment after the first twenty-four or forty-eight hours. If the surface is cold, apply hot sponging or a hot pack. Avoid causing chilliness. Improvement usually begins after two to four days. Resolution may be greatly encouraged by the use of alternate hot and cold compresses applied three or four times a day. It is also well to have the patient wear a warm wet compress over the chest at night to stimulate absorption.

CATARRHAL OR LOBULAR PNEUMONIA.

SYMPTOMS.—High fever; short, harsh, painful, hacking cough; other symptoms of croupous pneumonia; occurs most often in children as a complication of measles or whooping-cough.

This affection seldom occurs as a primary disease. It is most frequent subsequent to capillary bronchitis, the bronchitis of measles, and whooping-cough. When the peculiar cough of the latter disease is suddenly displaced by a short, hacking, painful cough, there is ground for suspecting this disease.

Treatment.—The treatment for this affection is essentially the same as that already described for croupous pneumonia. Cool compresses to the chest are especially to be recommended as among the most useful measures. According to Bartels and Ziemssen, both very eminent German authorities, cool compresses are " by far the most efficient mode of treatment." In children, in whom the disease is by far most frequent, the wet-sheet pack and the blanket pack are very useful. Use the vaporizer as for pneumonia.

CHRONIC PNEUMONIA.

SYMPTOMS.— Cough; evidences of bronchial irritation; sinking in of the chest wall upon the affected side.

This is a rare disease. It occurs most often after pneumonia, and accompanies many cases of consumption, causing the well-known and very characteristic sinking in of the upper part of the chest wall, particularly just below the cavicle.

Treatment.—Nothing can be done to cure the disease itself, as it consists in a hardening and contracting of the tissues of the lung, which cannot be overcome by any known method of treatment. The best of all remedies is the inhalation of hot vapor of water by means of a steam inhaler. Either pure water may be used, or water to which ten drops of the tincture of benzoin to the ounce has been added. Use the vaporizer as directed for chronic bronchitis.

CONSUMPTION.

SYMPTOMS.—Loss of appetite; emaciation; debility; malaise; frequent breathing; shortness of breath on slight exercise; pain in chest and shoulders; prickling, heat, and pain beneath the sternum; cough; hoarseness; expectoration of frothy mucus, rusty sputum, or mucus streaked with yellow; fever, highest in afternoon; chill or chilliness in morning or forenoon; night sweats; pointed nose, from emaciation, with motion of

nostrils at each breath; incurved nails; narrow chest, sunken beneath the collar bones; usually dullness of affected portion of lung when percussed; irregular or jerky respiration; abnormal sound in the lungs; hemorrhage; tubercle germs in the sputum.

This is one of the most formidable of all the maladies from which the human family suffers, being the direct cause of more than one-fifth of the deaths from all diseases combined. Notwithstanding the great interest which has always been taken in the study of this disease, it has not until recently been well understood, and even now presents many difficult problems. The symptoms above mentioned do not all occur in the same patient, as individual cases are seldom quite alike, but all belong to the disease, and any of them may occur in any case during the course of the disease. The disease usually begins insidiously, and progresses steadily to its termination, though not infrequently the patient will, at times, seem to improve very much, the disease seeming to be held in check. The rapidity of the progress of the disease depends much upon the temperament of the individual, his hereditary or acquired tendencies, and the particular conditions under which he is placed. The two sexes suffer with about equal frequency. The periods of life most subject to the disease are infancy to seven years, and twenty to thirty years of age in adults.

Owing to the extreme frequency of the disease, we ought, perhaps, to sketch the progress of the malady with somewhat greater definiteness. Its cause, as remarked, is different in different individuals ; but there are three principal types of the disease which may be definitely described. One patient has an attack of pneumonia ; it may be of the ordinary croupous form, or it may be of the catarrhal variety. Instead of recovering in a few days as is usually the case, he does not regain his usual strength, and continues to suffer with a slight cough and some shortness of breath. By degrees the cough increases, all the other symptoms become more aggravated, and the affected lung begins to break down, as shown by the character of the expectoration, which becomes yellowish, or streaked with yellow, and when cavities have formed, is coughed up in round, grayish masses which preserve their form. After the cough becomes severe, hemorrhages are also likely to occur, which, if very frequent, rapidly exhaust the patient's strength, although death seldom results directly from the loss of blood.

Another patient takes a severe cold in the fall, from which he does not entirely recover before spring. The next fall he takes a more severe cold, which lasts well into the summer. The following winter he con-

tracts a still more obstinate catarrh of the bronchial tubes, from which he does not become entirely rid during the summer, and which is augmented by a fresh cold the following winter. Thus the disease which was at first a simple acute catarrh, becomes chronic catarrh, and soon, by extension into the small bronchial tubes and air-cells, real consumption is occasioned. The cough continues, the fever rises, the expectoration becomes more abundant and purulent, the appetite fails, emaciation comes on, hemorrhage occurs, and the patient rapidly declines.

Still another patient has neither cough nor expectoration at the start, simply feeling weak and "good for nothing," gradually losing strength and flesh. Perhaps he is first startled about his condition by a hemorrhage from the lungs. Soon cough and frothy expectoration begin, and the patient fails rapidly. The progress of a case may also be determined to some extent by a bacteriological examination. In the incipient stage of the disease no bacilli are to be found. Later they appear in small numbers, but are not always present. In the advanced stage they are always present in great abundance.

The disease is sometimes divided into stages; but as it is impossible to discriminate closely between the three stages described, the classification is of no practical value. The disease begins with a consolidation of the lung tissue, a catarrh of the smallest bronchial tubes, or deposit of tubercles. After a time, there is a breaking down of the lung tissue from the destructive changes which occur in consequence of the morbid process, and cavities are formed. The matter expectorated, if examined under a microscope, shows the presence of portions of lung tissue. It is possible, by physical examination, to determine whether or not a cavity is present. The course and progress of these destructive changes are exactly indicated by the intensity of the fever. When it rises high, the disease progresses rapidly; and when it is checked, the disease is controlled. In some cases the destructive process is prolonged for years.

Causes.—The following may be mentioned as the most clearly traceable causes of consumption :—

1. *Impure Air.*—The health of the lungs depends more upon purity of the atmosphere than upon any other cause. There are numerous impurities to which the air is subject, but the most potent of them all in the production of consumption is what is known as the organic matter of the breath. This is always present in air which has been contaminated by the products of respiration, hence is found in abundance in the air of churches, lecture halls, school rooms, and other places where large

numbers of people congregate, as well as in most dwelling houses during the cold season of the year, when dwellings and other buildings are very seldom sufficiently ventilated. Some of our most eminent sanitary authorities assert that this organic matter is the most important of all the causes of consumption. The inhalation of dust is another active cause, the effect being to produce local irritation which gradually increases and extends more and more deeply into the air-tubes until the air-cells become involved. This cause is particularly active upon those engaged in the trades of stone-cutting, file-grinding, wool-carding, cigar-making, and other dusty occupations.

2. *Improper Diet.*—Errors in diet, particularly the use of food of an innutritious character or deficient in the elements of nutrition, and an insufficient supply of food, are very productive of conditions of the system which in the highest degree favor the occurrence of consumption. Young ladies who attempt to live on bread and butter and pickles, and older ones who make white bread and strong tea their staple articles of diet, are the favorite victims of this disease. The idea has been advanced that the use of an exclusively vegetable diet is productive of consumption, but no substantial evidence has been presented in favor of this view, and it can be clearly shown by irrefragable evidence that this is not the case. Indeed we have seen persons recover from the disease in its third stage when subsisting upon an almost exclusively vegetable diet. Vegetable food will sustain life well under all conditions, in health as well as disease, provided it is well digested and thus made into pure and healthy blood.

3. *"Taking Cold."*—A large number of those who suffer with this disease date the beginning of their trouble from "taking cold" at some time. This cause is seldom looked upon with that degree of seriousness which it really deserves. A cold is thought to be so trivial that it hardly requires medical attention at all, and thus many acute catarrhs which are in themselves trivial, lay the foundation for this more formidable malady. A cold should never be neglected. Drinking large draughts of cold water when the body is overheated by exercise has been pointed out by some as a cause of consumption, and there are reasons for believing that this may be the case. The practice is certainly a very pernicious one, often occasioning a great shock to the system, fully as much as is produced by exposure of the surface of the body to cold air.

4. *Tight Lacing.*—This absurd and not yet obsolete custom has contributed a large proportion of the victims to this disease. By

constriction of the chest, some portions of the lungs are rendered inactive, and these inactive parts are thus rendered unnaturally liable to this disease.

5. *Contagium.*—Another most important cause of this terrible malady is contagium. Within a few years it has been shown beyond chance for reasonable doubt that consumption is a communicable disease. It has been proven that the disease may be communicated through eating the flesh of tuberculous animals, and also by the use of the milk of consumptive cows. Furthermore, there is strong evidence that the disease may be communicated through respiration by breathing infectious particles exhaled by a consumptive person or animal. The danger is of course the more imminent the more closely confined the healthy person may be with the individual suffering with the disease, and the less attention is paid to ventilation. Numerous cases might be cited in which a kind relative or an attentive nurse has very closely followed a friend to a consumptive's grave. The probability is very strong that contagion, especially through the medium of consumptive animals, is really one of the most widely acting and active causes of this terrible malady.

The English medical journals are devoting considerable attention to the subject of consumption in cows and other animals. The *British Medical Journal* calls attention to the late report of Mr. Law, of Cornell University, to the National Board of Health, quoting from the report as follows:—

"Phthisical cows are often eaten without causing obvious disease in the consumers. I have known large dairies of tuberculous cows in the hands of vigorous and healthy looking owners, who consumed the milk freely. It may be freely concluded that a large number of individuals while in the enjoyment of robust health will withstand the influence of tubercle taken in by the stomach; but it must be otherwise with the weak and young, those with poor feeding and worse air, those living in damp, sunless localities, and subjected to much exposure. In a case that recently came under my notice in Brooklyn, N. Y., a family cow was found in an advanced state of tuberculosis, and the owner and his wife were evidently rapidly sinking under the same malady. In another case reported to me, a family cow, supposed to be suffering from lung-plague, was found to be afflicted with tuberculosis instead, and the owner's wife (a consumptive), who had been making free use of the milk, warm from the cow, was persuaded to give it up, and underwent an immediate and decided

improvement. It is for infants and adults who are somewhat infirm or out of health, or whose surroundings are not of the most salubrious kind, that the danger is greatest; but this embraces such an extended class that the moral interests involved are almost illimitable. The destruction of infancy and wasting of manhood from this cause is unquestionably far greater than has hitherto been realized."

Notwithstanding the opinion of Prof. Law that the milk and flesh of consumptive cows *may* be eaten by robust persons without injury, it is evident that there is at least a possibility that even the well may be affected, and where there is a hereditary tendency to consumption, the possibility will undoubtedly become a probability. Again, while a person might successfully resist the infection when in health, a sudden temporary indisposition, even that from a simple cold, might be sufficient to make him susceptible to, and entail upon him, a fatal malady. We agree with Mr. Law in thinking that this danger is far greater than is generally realized, and the present prospect is that the danger will increase rather than diminish.

6. *Sexual Excesses.*—Self-abuse and excessive venery are undoubtedly most powerful acting causes of pulmonary consumption. The enervating effects of these vices are felt by every organ in the body and not more by any other organ than by the lungs. We have seen many cases of consumption among young persons in which the disease could be directly traced to secret vice; and in a number of instances we have met cases in which the evidence was too strong to be mistaken that excessive sexual indulgence with the opposite sex was the real foundation of the disease. This should be borne in mind by persons suffering with this affection, as in many cases the sexual desires are not abated even though the disease may have reached an advanced stage, although their gratification is in the highest degree detrimental to the prospects of recovery.

7. *Foreign Bodies.*—Certain trades, such as stone-cutting, file-grinding, wool-carding, cigar-making, manufacturing of hats, and other occupations productive of much dust, which the workmen are obliged to inhale, are exceedingly productive of disease of the lungs. The fine particles which are received into the lungs produce, first, simply a slight irritation which results in congestion, and finally settled catarrh, which, gradually working down into the fine air-tubes of the lungs, at last involves the air-cells and gives rise to morbid processes the final result of which is consumption. We have met a num-

ber of cases in which the disease originated in this way. Fig. 311 illustrates the microscopical appearance of a small portion of the lung of a person who died of consumption which resulted from the inhalation of charcoal dust.

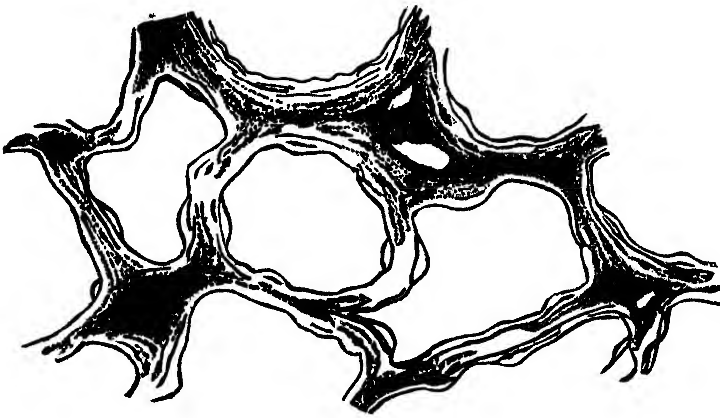


Fig. 311.

It will be observed that the lung tissues are so completely filled with the fine particles of charcoal that the lung has become almost as black as the charcoal itself. In cases in which persons have become consumptive by the inhalation of fine particles of stone while working at the trade of stone-cutting, the lung frequently contains so large a quantity of stony particles as to have a gritty feeling, and resist the edge of a knife. The deposits of blood in the lungs are the result of hemorrhage, another cause which should be mentioned. It is generally supposed that hemorrhage from the lungs is positive proof of the existence of consumption. This is a mistake, however, as it not infrequently happens that the hemorrhage is itself the cause of the disease rather than the result; portions of blood left in the lungs undergo a kind of degeneration, which soon results in the formation of tubercles, and finally in the breaking down of the lungs and the formation of cavities.

8. *Various Diseases.*—From the examination and study of several hundred cases of lung disease within the last twenty years, we are well satisfied that consumption is a primary disease in but a small proportion of cases. In a majority of consumptive persons whom we have met, their history has shown very clearly that the system was first

weakened and debilitated by some other affection before the pulmonary difficulty manifested itself. We have become fully convinced that dyspepsia is a very common cause of consumption. Through impairment of the digestion, the blood becomes of poor quality, the patient loses flesh and strength, and his power to resist the causes of disease becomes so susceptible that slight things which in health would not have affected him at all are sufficient to lay the foundation for a fatal malady. A great majority of persons who suffer from chronic diabetes finally die of consumption. This is also a very common termination for the wretched and misspent lives of syphilitic patients. Typhoid fever, measles, whooping-cough, chlorosis, intermittent and other malarial fevers, and other affections which merely debilitate the system, frequently terminate in consumption.

9. *Alcoholic Drinks.*—Dr. Richardson has recently shown that the use of alcohol not only predisposes an individual to consumption, but that it entails upon him liability to a peculiar form of the disease which is the direct result of alcoholic poisoning. This is particularly true of persons who use liquors to an immoderate degree, but it is also true of moderate drinkers as well. The facts demonstrated by Dr. Richardson furnish an unanswerable objection to the employment of alcoholic drinks as a preventive of consumption, for which it has been so highly recommended by many physicians. It also clearly interdicts its use as a curative remedy.

10. *Tobacco.*—It is well known that the use of tobacco is exceedingly productive of catarrh of the nose and throat, which fact alone is sufficient to condemn its use, if it were impossible to show that its deleterious effects upon the respiratory organs extended no farther than the organs mentioned, since it is well known that catarrh of the throat very frequently extends by slow degrees into the larger and then to the smaller bronchial tubes, finally setting in operation the degenerating changes and processes which result in the destruction of the lungs.

11. *Depressing Mental Influences.*—Long-continued grief, fear, anxiety, disappointment, together with other depressing mental influences, often result in the production of conditions of the system which render the individual thus suffering open to the inroads of pulmonary disease. The recognition of this fact ought to lead every individual who is from any cause so situated as to be subject to depress-

ing influence to contend strongly against such influence rather than to give way to their emotions and allow themselves to become the prey of circumstances. Causes of this kind can be contended against as successfully as those of any other sort. The depression arising from too close confinement to mental labor, especially when it is of a very taxing or onerous character, operates in the same way as depressing influences of any other sort.

12. *Heredity.*—It is very rare that the disease itself is inherited. The unfortunate inheritance is simply a tendency to the disease, or a susceptibility of constitution which increases an individual's liability to the affection. There is no doubt that it is entirely possible for the individual whose family is consumptive in a marked degree, and whose inherited tendency is unmistakable, to so regulate his course of life as to overcome the tendency, at least in a very large degree, and to so fortify his constitution against this malady as to prolong his life to the natural limit of human longevity.

13. *Prolonged Nursing* is another cause of pulmonary disease to which attention should be called. Many mothers have survived the risks and sufferings of childbirth only to die victims to the long-continued drain upon their system arising from prolonging the period of lactation beyond its natural limit. Healthy mothers with robust constitutions may do this with impunity ; but a weakly woman who has given birth to several children in rapid succession, and whose constitution has been materially weakened by the excessive demands upon her sexual and nutritive forces, even perils her own life by the maintenance of that of her child. We do not wish to give any countenance to the evil practice becoming so common, especially in large cities, of employing wet nurses for the simple purpose of relieving mothers of the inconvenience of nursing and caring for their own offspring, when they are well able and qualified by nature to do so ; but it often becomes the duty of the observing physician to urge upon a weakly mother the discontinuance of nursing as the only means of safety to her own life and possibly also of her child, to whom the insidious pulmonary disease might be imparted through the medium of mother's milk.

14. *Climate.*—Much has been said about the influence of climate as a cause of consumption; but we think that much more has been charged to climate than is really just. The opinion prevails that the inhabitants of cold climates are particularly subject to diseases of the

lungs, especially to tuberculosis; but within a few years it has been clearly shown by careful observation that dwellers in cold climates are no more subject to the disease than the inhabitants of the tropical regions. In fact, some nations living at the extreme north are almost wholly exempt from the malady which is the greatest bane of the race in temperate climates. The truth in regard to this matter seems to be that consumption is most prevalent in countries in which the climate is changeable, being subject to sudden and rapid alternations of heat and cold. Either steady cold or moderate, continuous heat are much more favorable to health of the lungs than alternations of temperature.

Treatment.—The first and most important measures of treatment are those which contemplate the prevention of the malady. These consist first, of a careful avoidance of all the known causes of the disease; and second, of the most strenuous efforts to counteract any known tendency to it through heredity. The infants of consumptive mothers should not be allowed to nurse unless a healthy wet nurse is employed. Children with a scrofulous or consumptive tendency should be kept in school but little, and should be given every opportunity for physical development. When grown to adult age such persons should not engage in any occupation which is known to favor lung disease, but should make all their habits and conditions, so far as possible, tend toward the one object of contending against their hereditary tendency. In the treatment of the disease when it has developed sufficiently to be recognized, it is important that prompt and vigorous measures should be employed at once. The greater portion of the sufferers from this disease sacrifice their only hope for life by delay and procrastination. If the disease has obtained even the slightest foot-hold, there is no time to be lost. The principal indications to be met are; 1. To check the fever; 2. To improve the patient's nutrition; 3. To arrest the night sweats; 4. To alleviate the cough; 5. To develop the lungs; 6. To sustain and invigorate the patient in every way possible. The best means to be employed for the above purposes, according to the results which we have obtained in the treatment of hundreds of cases of this disease, are the following:—

1. *To Check the Fever.*—If possible, prevent the chill which almost always precedes the fever, by keeping the patient in bed until an hour or two after the usual time for chilling is past, placing warm jugs or bricks at his feet, so as to keep him warm, but taking care not to induce perspiration if it can be avoided. When the patient suffers

with no well-defined chill, but has wandering and irregular sensations of chilliness, this plan cannot be adopted; but the patient should remain quiet in bed during the early part of the day, and if the fever runs very high, it will be better for him to remain quiet in bed for several days in succession, provided, of course, that he can have other proper treatment at the same time. By this means the patient's vitality and strength will be economized; but he must not be confined in bed for a long period, as he needs the advantages of out-of-door air and exercise. As soon as the fever is materially lessened, let him resume his daily walks and rides in the open air. Copious water drinking, at least to the amount of three to six glasses of water a day, is another means by which the fever may be successfully lowered. The employment of sponge baths at the time when the fever is highest, is a means of great comfort to the patient. Either pure water or water containing one-third its measure of alcohol may be employed in sponging the patient. Inunction on the dry, parched skin, after moistening it by a wet-hand rub, is another measure not to be forgotten. When the patient is strong and does not suffer with night sweats, a wet compress worn about the chest often affords very great relief from the parching fever.

2. *To Improve the Patient's Nutrition.*—As defective nutrition is one of the principal causes of consumption, the improvement of the patient's nutrition is one of the most essential features of the treatment of this disease. In order to accomplish this, attention must first be given to improvement of the digestion. If the patient is suffering with any of the various forms of dyspepsia, he must receive such treatment for the same as has been already described in the section on "Diseases of the Digestive Organs." This is a matter of very great importance, though it is often overlooked, the supposition being that the stomach disorder depends upon the disease of the lungs rather than the contrary, which is really the case. The diet of the patient should first consist of such food as he can best digest. In many cases, milk and eggs with well-cooked grains and a small allowance of fruit, constitute the dietary best adapted to the condition of both the lungs and the stomach. Dr. Salisbury, of Cleveland, who has a peculiar theory regarding consumption, believing that it originates from the products of fermentation in the stomach, requires his patients to abstain from the use of fruit and sweet and starchy foods altogether, and to depend almost exclusively upon lean meat with a very small allowance of bread. He

requires his patients to take several pounds of beef steak or other lean meat daily. He claims very extraordinary results from his plan of treatment. His plan differs from that which we have followed for a number of years in but the one particular of diet. We have never thought it necessary to confine patients to an exclusively nitrogenous diet, and believe there are several evils which may arise from this course, which are perhaps as great as those growing out of the disease itself. We have also obtained by our plan results as remarkable as any claimed by Dr. Salisbury. We shall have to receive considerable more evidence than has yet been produced to convince us of the necessity of depriving consumptive patients of fruits and grains, and confining them wholly to flesh diet. The daily employment of massage, and inunction at least two or three times a week, together with daily sponging with salt water, are excellent means for stimulating nutrition. To these measures should be added, when possible, a sun bath daily from half an hour to two hours in length, according to the patient's strength and the frequent use of electricity in the form of general faradization.

3. *To Arrest Night Sweats.*—The exhausting sweats from which many patients suffer, particularly at night, or at any time when asleep, should be checked as speedily as possible. The best means of accomplishing this are the use of the salt sponge bath at night; sponging the body with a mixture of alcohol and water in proportion of one part of the former to two of the later; and sponging with hot water at bedtime. The last remedy we have employed very frequently of late, and are much pleased with the results afforded by it in the prevention of these exhausting sweats. It is important that patients suffering in this way should know that the sweats are greatly aggravated by opium in any form, and hence are increased by cough mixtures of any sort which contain this drug.

4. *To Alleviate the Cough.*—This troublesome symptom is often one of the chief sources of weakness and increasing debility, since it deprives the patient of his necessary rest at night and excites him with continued and harassing efforts to relieve the unpleasant sensations by which it is provoked. Not infrequently the cough is produced, not by the condition of the lungs themselves, but by some form of irritation in the throat. This chronic irritation of the larynx is quite frequently itself produced by elongation of the palate. The cause of the cough should always be sought for, as it not infrequently happens that much

annoyance and waste of strength will thus be saved. If the difficulty is chiefly in the throat, it will be readily relieved by soothing gargles and other treatment, such as has been described for inflammation or chronic catarrh in this location. Very simple remedies are often effective to relieve the most distressing cough, such as gargling of water in the throat, holding pieces of ice in the mouth, taking occasional sips of strong lemonade, and similar remedies. The best of all means of allaying the irritation of the throat we have ever found is the inhaler which has already been described. (See Fig. 274.) Another measure for the relief of cough is the application of fomentations to the chest and between the shoulders. These applications should not be given more than once or twice a day. The time of each application should not extend over fifteen or twenty minutes. If the patient perspires easily, great care will be necessary to prevent weakening him by exciting perspiration by fomentations. In this case the application to the chest of dry heat by means of the hot-water bag is better than the use of fomentations. A tepid compress applied to the chest at night will frequently relieve the harassing night cough. The application should be made with a soft woolen cloth of two thicknesses, which should be wrung as dry as possible and should be covered with several thicknesses of dry flannel to retain the warmth and moisture. The chest should be rubbed in the morning with the hand dipped in cool or tepid water, and covered with a dry flannel or chest protector through the day. The use of various cough mixtures for the relief of cough is generally attended by more harm than good, as a majority of them contain opium, to which their effectiveness in relieving cough is chiefly due, but which encourages the exhausting night sweats, and hence really occasions much harm, though temporarily contributing to the patient's comfort. As a general rule, patients run down, and the disease progresses much more rapidly after beginning the use of opium in any form.

It should be borne in mind that cough is merely a symptom, the significance and importance of which varies greatly in different cases. Sometimes it is best that it should be encouraged instead of being repressed. When the patient expectorates very freely, the cough is a necessary means of relieving the chest of matters which would seriously interfere with the functions of the lungs if retained, by filling up the bronchial tubes and air-cells. Cough is important in such cases as these, as the suppression of expectoration would be the surest means of hastening the death of the patient rather than encouraging the recovery. The

kind of cough which it is important to relieve is an irritable, ineffective cough, unaccompanied by any considerable degree of expectoration. This cough is sometimes excited by the irritation occasioned by an elongated uvula, for which the proper remedy is snipping off the end of the offending organ. Loaf sugar, honey, or a mixture of honey and lemon juice and other simple remedies familiar in every household, are often effective in relieving a cough which is accompanied by little expectoration. In cases in which cough cannot be relieved in any other way, and is very distressing and painful, the use of an opiate mixture is sometimes advisable, but should be administered only under the advice of an intelligent physician.

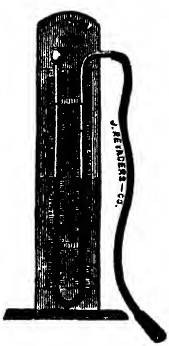


Fig. 312. Pneumatometer.

Fig. 313. Spirometer.

5. *To Develop the Lungs.*—As one of the causes of lung disease is deficient exercise of the lungs, it naturally follows that suitable exercise of these organs constitutes one of the most important measures of treatment. The general means which may be employed for developing the lungs has already been described under the head of "Lung Gymnastics," page 720. Too much emphasis cannot be laid upon the importance of giving attention to these measures of treatment. The patient should make it a large part of his business each day to attend to his respiration. At frequent intervals he should expand his lungs to their full capacity

(avoiding violent efforts, especially when there is danger of hemorrhage), repeating the exercise at frequent intervals through the day. One of the most observable features of this disease is progressively increasing rigidity of the chest walls and decrease of motion in the affected portions of the lungs. The loss of respiratory power is very readily shown by means of the pneumatometer (Fig. 312). A healthy adult will easily raise the column of mercury of the instrument to 60 or 100 degrees. But we have frequently found patients who could not produce an indication of more than two or three degrees, showing an almost entire loss of respiratory power. The diminished lung capacity is admirably shown by the spirometer, one form of which is shown in Fig. 313. Too little attention has been given in the treatment of consumption to regular and systematic efforts to develop the lung power and capacity, notwithstanding the full recognition of the fact that their loss is one of the most marked features of the disease. Another means of increasing the lung capacity and power is special exercise, both passive and active, applied in such a way as to increase the strength of the respiratory muscles. Of active exercises some of the best are given under the head of "Swedish Movements" (Figs. 232–272). Passive movements consist chiefly in the rubbing and percussion of the muscles of the chest and back, and in the application to the patient, by an attendant for at least a half-hour daily, of some one of the most approved forms of artificial respiration. That described elsewhere as Sylvester's method is very convenient for this purpose. Another measure which we would strongly recommend is the application of electricity to the muscles of the chest. The application should be made sufficiently strong to cause contraction of the muscles. The best mode of application is to place the positive pole between the shoulders, applying the negative along the spaces between the ribs so as to cause contraction of the intercostal muscles. The application should also be made to the pectoral muscles which form the fleshy part of the breast. In addition to the other measures described, probably the best of all means of expanding the chest and increasing lung power is the pneumatic apparatus devised by Waldenburg, the construction and use of which has been described elsewhere. (See Fig. 218.) We have now used this apparatus in quite a number of cases and have obtained decidedly beneficial results. We regard it as one of the most important remedial appliances for use in such cases. It is, of course, too cumbersome and expensive to be adapted to the home treatment of this disease; but a simple form of the apparatus may be

readily constructed by almost any tinsmith, which will enable the patient to derive nearly all the advantages of the pneumatic method of treatment.

6. *To Sustain and Invigorate the Patient in Every Possible Way.* —As this disease is characterized in a remarkable degree by progressively increasing debility, no means should be neglected which will contribute in any degree to sustain the patient's strength and reinforce his waning vitality. A nourishing diet, abundance of sleep, cheerful surroundings, a plentiful supply of pure, fresh air, abundant daily exercise in the open air, particularly in horseback riding, exposure to the action of the sun's rays by exercise in the sunlight as well as by sun-bathing, and total abstinence from all depressing influences of every sort, are among the essentials of the hygienic management of this disease. Tonic applications of electricity and the judicious use of bathing, together with the daily employment of massage, frequent inunctions, and all other means of improving nutrition, are necessary parts of the successful plan of treating serious cases of pulmonary disease. Patients should be cautioned in regard to exercise, against exerting themselves to a degree to induce extreme fatigue, and to avoid violent exercises of all sorts, such as running, leaping, walking, going rapidly up stairs, speaking in a loud tone, or singing for a long time, or in any other way overtaxing the respiratory organs. Care should also be taken to avoid exposure to sudden changes of temperature. Patients accustomed to a warm atmosphere most of the time should in cold weather wear a respirator. In the absence of a respirator, an ordinary cotton handkerchief may be used for the purpose with advantage, being tied over the mouth and nostrils in such a way that the air drawn into the lungs must pass through it.

7. *Climatic Treatment.*—Careful observations have shown that persons residing in certain regions of the earth are almost wholly exempt from tubercular disease of the lungs. These regions are found to be uniformly in elevated or mountainous districts. This fact has led, within the last few years, to general recognition of the importance of a high altitude in the treatment of pulmonary consumption. A famous specialist in pulmonary ailments uniformly says to his consumptive patients, " You must go a mile high into the air if you wish to get well." This means an altitude of 5000 feet or more. Within the last twenty years the writer has had an opportunity for extended observation of the results of the climatic treatment of consumption,

and feels assured that nothing can be safely regarded as a substitute for it. Various localities in the Rocky Mountain region of the United States are favorable for consumptives. Many persons whom the writer has sent to these regions, and who appeared to be almost hopeless cases, have recovered and are still alive, although they would certainly have been in the grave long ago if they had not had the advantage of living in an elevated region. So many of these cases found the locality of Boulder, Colo., especially favorable to their recovery, that a sanitarium has been established at that point under the management of the Battle Creek Sanitarium. This institution is already in successful operation, and many remarkable recoveries have been reported.

Another sanitarium under the same management has been established at Guadalajara, Mexico, a region in which perpetual summer reigns at an altitude of over 5000 feet above the sea.

8. *The Tuberculin and Antitoxic-serum Methods.*—The expectations raised by the discovery of tuberculin by Koch were not realized in practical experience with this remedy, which consists of the poisonous substance developed by the germs of tuberculosis, well grown in a proper culture fluid in glass tubes. The investigations of other experimenters have not developed results materially better than those of Koch. Recent experimenters in France and in this country, following the plan adopted in the production of diphtheria antitoxin, have undertaken to cure tubercular disease of the lungs by injection of the serum of horses which had previously, by repeated treatment of small doses of consumptive germs and tuberculin, been rendered proof against the disease. Some favorable results have been reported.

In conclusion, a word must be said with reference to some popular errors concerning the disease. One of the most prominent of these is the idea that the use of alcohol is one of the most successful means of checking the progress of the malady. Many physicians have encouraged this error, and not a few drunkards have been made such by a physician's prescription, the intent of which was to cure the patient of a grave malady, but the effect of which was to make him the victim of a terrible vice. Evidence is yet wanting to show that alcohol has any curative value whatever in consumption, and there is plenty of evidence to show that the habitual use of liquor is one of the surest means of producing this disease. Within the last few years cod-liver

oil has become a fashionable remedy for disease of the lungs. It is now generally admitted, however, by the most intelligent and experienced members of the profession, that the advantages claimed for this remedy are by no means substantiated by experience, and that its chief utility, if it has any, is simply due to its nutritive value as oleaginous food.

The Perfection Vaporizer is one of the most useful instruments which has been devised for the treatment of diseases of the air passages. By its aid, antiseptic vapors of various sorts may be introduced into the air passages in a more efficient manner than by most other similar instruments. (See Appendix.)

Another instrument of special value in the treatment of consumption is the exhalation tube, shown in Fig. 272½, page 721. It can be obtained from the manufacturers, The Modern Medicine Company, Battle Creek, Mich.

It is perhaps needless to say that the numerous quack remedies for consumption advertised in the newspapers are wholly without merit. There is no known drug which will cure this disease, or in any certain degree influence its progress. Numerous remedies have been recommended at various times as curative, but not one has thus far stood the test of experience. The reputation acquired by certain popular remedies are chiefly built upon fictitious cases and cases of individuals who may have recovered from some disease which was supposed by the individuals themselves to be of a consumptive character, but which was really of a much less serious nature. What has been said of quack medicines is also true of the numerous domestic remedies for this disease.

MILIARY TUBERCULOSIS.

***SYMPTOMS.**--Frequent chills; fever; very frequent and small pulse; exhausting sweats; dry tongue; often delirium or stupor; great prostration; cough; shortness of breath; at last, œdema of the lungs.*

This disease must not be mistaken for what is known as acute or galloping consumption. It is the general manifestation of the same disease which in consumption is chiefly confined to the lungs, and in its course so closely resembles typhoid or intermittent fever that a correct diagnosis is frequently not made. An examination of the lungs shows almost an entire absence of the particular symptoms of local disease in these organs, about the only symptom which can be discovered being

great shortness of breath. The absence of symptoms in the lungs is due to the fact that all parts of them are equally affected, while in ordinary consumption some particular part of the lungs is diseased, other portions often remaining in a nearly healthy condition. An examination after death shows the mesenteric glands, spleen, liver, and in fact all parts of the body, to be affected with tubercles. The disease usually runs a rapid course, the patient dying, in most cases, in from forty to sixty days. The disease is generally a primary one, and is probably due to infection of the system with tuberculous matter. It seems to us probable, though the fact has not yet been proven, that infection most often occurs by the use of the flesh or milk of consumptive animals. It also sometimes occurs in the latter stages of consumption, the whole system becoming affected by the local disease.

Treatment.—Little can be done except to render the patient as comfortable as possible, since there is little hope of recovery; but as there is always a possibility of mistake as to the nature of the disease, efforts for the relief of the patient should be unabated, even to the last. The most important measure of treatment is to control the raging fever as much as possible by sponge baths, compresses, etc. The same general rules of treatment should be followed which have been recommended for consumption. Cold applied to the chest is one of the best remedies for the shortness of breath. Ice should be applied to the head freely if the patient suffers much with headache, as is frequently the case.

PLEURISY.

SYMPTOMS.—ACUTE : *Chilliness; fever; sharp pain or "stitch" in the affected side, generally located below the nipple; pain increased by coughing, pressure, or lying on affected side; hot, dry skin; flushed cheeks; hard, quick pulse; frequent, short breathing; great nervousness; usually at first a grating sound heard over affected part; urine scanty and high-colored.*

CHRONIC : *Increasing debility and shortness of breath; slight pain; hacking cough; small, rapid pulse; slight fever; clear mucous expectoration; accumulation of fluid in the cavity of the chest.*

This is a very common disease, though not as common as is generally supposed, since many people are in the habit of calling every pain or "stitch in the side" a pleurisy pain. Transient pains of this character are much more frequently due to intercostal neuralgia than to pleurisy. The disease consists in the inflammation of the pleura, a membrane which lines the chest-walls and covers the lungs. The acute type of the disease occurs in two forms, one of which is termed dry pleurisy, because

there is no exudation or effusion. This disease presents scarcely any symptoms at all. It consists in the thickening of the pleura and adhesion of the lung to the chest-wall, and as it usually produces no serious results, it demands but little attention. In the several varieties of the form of the disease in which exudation or effusion occurs, more or less of the symptoms are found. Acute pleurisy usually runs a rapid course and ends in recovery. The exudation is generally very slight. The chronic form of the disease generally begins very insidiously, though it occasionally follows the acute form. It is accompanied by the accumulation of a large amount of fluid in the chest upon the affected side, which causes compression of the lungs and displacement of the heart, the latter organ being crowded over to one side or the other, according as the accumulation of fluid is in the right or left cavity of the chest. As the disease occurs most often upon the left side, the heart is generally found nearer the middle of the chest than it should be. In a patient whom we had under treatment a few months ago, we found the left cavity almost completely filled with fluid, the lung entirely collapsed, and the heart crowded entirely over upon the right side. The fluid in chronic pleurisy may be simply serum, or it may contain a larger or smaller proportion of pus. Cases in which the cavity is filled with pus are termed *empyema*. Adhesion of the lung to the chest-wall almost invariably takes place in all cases of pleurisy when recovery occurs. No particular harm results from this condition, however. In chronic pleurisy, the chest upon the affected side generally becomes contracted, and the lung rarely becomes fully expanded to its natural size.

Causes.—The causes of pleurisy are, 1. Injury to the pleura, as from fracture of the ribs; 2. Other diseases of the lungs, as pneumonia, consumption, or cancer; 3. General disease, as rheumatism, blood poisoning, scarlet fever, etc.; 4. General causes of an obscure nature not well understood, but probably similar to those which give rise to pneumonia, among which may be reckoned exposure to cold.

Treatment.—The principal treatment required by the acute form of this disease is confinement in bed; a restricted diet, consisting of oatmeal gruel, fruits and grains, and other light vegetable food; avoidance of animal food of all kinds excepting milk, of stimulating condiments and intoxicating beverages of all sorts; and for the relief of pain, hot fomentations applied continuously for several hours if necessary. The hot-water bag is a very useful means of applying fomentations in these cases. By wrapping the bag in a flannel cloth wrung out of hot

water the heat will be retained very much longer than when a fomentation is applied in the usual way. In cases in which the fever is high and the acute symptoms have passed away, a wet-sheet pack may be administered, or the patient may be sponged frequently with tepid water. In some cases the application of cold to the chest, by means of cloths wrung out of cold water, or even ice compresses, gives more relief than hot applications. In still other cases, the local symptoms are best controlled by means of cold compresses alternated at intervals of an hour or two with short fomentations. A tight bandage applied about the chest is an efficient means of relieving pain and cough.

Chronic pleurisy is a much more obstinate malady. It is generally not recognized until after its effects have become fully developed. If the accumulation of fluid in the chest has existed for several months, the collapsed lung becomes so permanently injured that its full use can seldom be recovered. The first object in treatment should be to induce, if possible, absorption of the fluid. This may best be done by the use of all measures which will improve the patient's strength and vitality. The same general course should be followed for this purpose as is recommended in the treatment of consumption. In addition to these general measures, alternate hot and cold applications should be daily made to the chest. Electricity may also be used with benefit. If the patient is strong, the vapor or hot-air bath may be employed with advantage two or three times a week. If, after the faithful employment of these measures for a reasonable length of time, there are no evident symptoms of improvement as indicated by a decrease in the shortness of breath, the cough, and the amount of fluid in the chest as shown by percussion, the fluid should be removed from the chest by tapping or aspiration.

HYDROTHORAX—DROPSY OF THE CHEST.

***SYMPTOMS.**—Great difficulty in breathing, or shortness of breath, especially on slight exertion: dullness on percussion of the lower part of the chest.*

Dropsy of the chest, or, as the disease is generally termed in popular phraseology, "water on the chest," is rarely a primary disease, generally occurring in connection with general dropsy, resulting from disease of the heart or kidneys.

Treatment.—Measures of treatment should be directed toward the primary disease of which this affection is simply a result. These measures, which are more fully described elsewhere, consist chiefly in such

remedies as will excite great activity of the skin, as vapor and hot-air baths. In case general measures are not sufficient to cause absorption of the fluid, tapping or aspiration of the chest may become necessary. Fig. 314 represents one of the best forms of apparatus for performing aspiration, which is much to be preferred to the old operation of tapping. In using this instrument, the chest is punctured with a fine needle which is hollow and is connected with a flexible tube, which is, in turn, connected with the cylinder of an air-pump. By the creation of a vacuum, a strong suction force is exerted, which produces a steady flow of fluid through the needle into the instrument, from which, by reverse action, it is expelled into a convenient vessel. Several simple forms of this apparatus have been devised. The simplest of all is the ordinary Davidson's syringe. On one occasion, when our aspirator was accidentally broken by an assistant just as we were about beginning an operation upon a patient whose left lung cavity was almost completely filled with pus, we performed the operation by means of the Davidson's syringe, as suggested by our old teacher, Prof. Austin Flint, Sen., of Bellevue Hospital, by whom this ingenious method was first employed. In the case referred to, we removed several quarts of green pus which had been confined within the chest for more than a year. The relief afforded the patient by removal of the fluid is generally very great, though at first severe coughing is produced by expansion of the partially collapsed lung. Unfortunately, complete recovery rarely takes place, owing to the obstinate character of the disease upon which this affection depends.

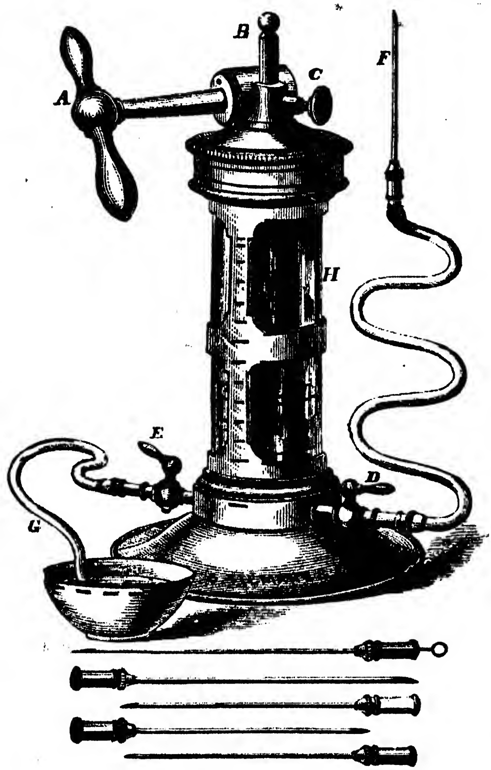


Fig. 314. Aspirator.

PNEUMO-THORAX.

***SYMPTOMS.**—Patient feels as though "something had burst" in his chest; very difficult breathing; patient lies upon the affected side, or sits up; severe pain in the region of the lower ribs; intercostal spaces obliterated on the affected side; when on left side, displacement of the heart to the right side; if on right side, displacement of the liver downward; [illegible] resonance of the chest; usually, also, fluid, which changes position [illegible] of patient; absence of natural breathing sounds; splashing sound [illegible] placing the ear to the chest and shaking the patient quickly.*

In this disease, one of the cavities of the chest is filled with air, the lung being in a state of collapse. The cause of the disease is perforation of the lung, which may result either from accident, as from a wound by a bullet, knife, or bayonet, or it may be the result of breaking down of portions of the lung, as in emphysema and consumption. With each active inspiration the air passes through the opening in the lung into the pleural cavity, and as the opening is generally ragged, so that the air cannot escape during expiration, the quantity of air increases with each breath, until the pressure within the cavity becomes so great as to equal the force of an inspiration. Sometimes, in case of wounds, the lung cavity is connected with the connective tissue spaces, and the air penetrates the tissues of the chest and trunk, causing, in some instances, enormous bloating. The lung on the affected side is, of course, completely compressed, so that no air can enter it. Much pressure is also exerted on the lung on the well side, caused by the expansion of the affected cavity. When the perforation occurs on the left side, the heart is crowded over to the right. We have met instances in which the apex beat of the heart, which is usually felt just beneath the nipple, was displaced, by the pressure of air in the left cavity, to the extreme right side of the breast-bone. Within a day or two after perforation occurs, pleurisy is usually set up, which occasions the exudation by which the cavity is gradually filled, in some instances completely. This disease is, fortunately, quite rare. It is difficult to cure. In many instances an operation for removal of a portion of the rib, so as to maintain a permanent opening into the chest cavity, is essential to afford opportunity for thorough cleansing and disinfection of the pleural cavity. The lung is usually disabled by the disease, the chest wall collapsing, and the shrunken lung becoming adherent to the inner surface of the chest.

SYMPTOMS RELATING TO THE RESPIRATORY ORGANS.

Cough.—Coughing is a convulsive expiratory effort, usually repeated several times in rapid succession. It is symptomatic of several varieties of conditions, but by no means always indicates disease of the respiratory organs. It is present in consumption, pneu[illegible] pleurisy, chronic bronchitis, emphysema, pharyngitis, laryng[illegible] using[illegible] appear as a symptom in nearly all diseases of the respirato[illegible]st. It may also appear as a symptom of disease of the spine and spinal cord, of the œsophagus, the heart, the liver, and the stomach. In occasional instances, it may arise from the irritation of worms in the intestines, from the pressure of tumors in the chest, as well as from gout, rheumatism, and uterine and ovarian derangements. Occasionally it is seen in very young children who are teething, being due to sympathetic irritation. Attention has very lately been called to what is known as *ear cough*, arising from disease of the ear.

Chin Cough is a term frequently applied to a light, hacking cough in small children, arising from slight irritation of the throat or air-passages. It was formerly applied to whooping-cough.

Stomach Cough is generally due to pharyngeal catarrh, which results from derangement of the digestion.

Nervous Cough is often occasioned by disease of the spinal cord. Under this head may also be included cough which is dependent more upon habit than upon any local disease.

Painful Cough usually arises from some serious disease of the respiratory organs.

Hacking or Tickling Cough is quite frequent in the first stage of consumption when it results from sympathetic irritation. It may be due to an elongation of the palate.

Heavy or Hollow Cough is one of the symptoms of chronic bronchitis and advanced consumption, and is usually attended by copious expectoration.

Dry or Tight Cough is the accompaniment of the first stages of cold in the chest. It is due to congestion, with slight secretion.

A Short, Sharp Cough generally accompanies the first stage of pneumonia.

The Hoarse, Barking Cough of croup is readily recognized by its peculiar character. In true or membranous croup, the hoarse, barking character gives way to a whistling cough. A loose cough, attended by a slight rattle, is an indication of improvement in the last-named disease.

The Whooping Cough, characteristic of the disease of that name, is so called from its violent spasmodic character, and from the fact that the spasmodic expiratory efforts attending the cough in this disease are terminated by a very greatly prolonged inspiration, attended by the peculiar sound very aptly termed a whoop.

Treatment.—The remedies for a cough vary according to its cause. An irritable, hacking cough can often be relieved by means of a little lemon juice, dissolving a small piece of white sugar upon the tongue, or chewing slippery elm. Simply gargling a little hot or cold water will give relief, as well as the use of a steam inhaler. Painful cough is best treated by hot applications for the relief of the pain. Liver, stomach, and ear coughs are cured by treatment of the organs primarily affected. Nervous cough can often be cured by a simple effort of will-power. The patient having formed the habit of coughing from a slight temporary irritation of the throat, continues to cough when the original cause is removed. By a simple exertion of the will, this cough can usually be controlled. Equal parts of lemon juice and honey will frequently relieve a harassing cough. The chest compress is also useful.

Pain in the Chest.—Pain in the chest may be stinging, burning, or lancinating in character; it may be dull and continuous, or sharp and only occurring at intervals. Patients also frequently complain of weight, oppression, constriction, and tightness in the chest. Sharp pain is most often due either to neuralgia or pleurisy. Dull pain in the right or left side, beneath or between the shoulders, may be due to affections of the liver, spleen, or stomach, as well as to pulmonary disease. A stinging or burning pain beneath the breast-bone is one of the symptoms of chronic bronchitis.

Treatment.—The best remedy for pain in the chest is the application of hot fomentations once or twice a day; and if the pain is chronic, the application of a warm compress to be worn through the night. Extensive pain in the chest may require a chest pack. A stitch in the side and the acute pain of pleurisy are often very greatly mitigated by the application of a soft woolen bandage drawn tightly about the chest in such a way as to restrain the movement of the affected part in respiration. The same end may be reached by applying a large pitch plaster or several adhesive strips over the affected part.

Shortness of Breath.—This symptom may arise from restriction of respiration caused by pain, as in pleurisy and often in intercostal

neuralgia, or it may arise from the disablement of a larger or smaller portion of the lungs, as in pneumonia, dropsy of the chest, chronic pleurisy and pneumo-thorax. Shortness of breath is also present as a marked symptom in consumption, and in congestion of the lungs arising from any cause, particularly from disease of the heart. Simple weakness, as in case of nervous debility, may give rise to shortness of breath.

Treatment.—The proper remedy is the removal of the cause. When this can be accomplished, the difficulty will speedily disappear; but, as in many cases the cause is one which cannot be remedied, the symptom, of course, remains, notwithstanding the application of the most varied remedies; and the most that can be done is to mitigate the inconvenience occasioned by this often very distressing symptom. The aggravation of this symptom by exercise suggests that, when it is very urgent, the patient should be kept as quiet as possible. When it is due to the accumulation of gas in the stomach and bowels, as sometimes happens, speedy relief may be obtained by the evacuation of the bowels by a copious hot enema. Shortness of breath due to pain or congestion is generally relieved by hot fomentations. When due to disease of the heart, galvanic electricity applied to the sides of the neck sometimes gives very great relief. In dropsy of the chest, tapping or aspiration is sometimes a means of affording great comfort, at least temporarily.

In cases of emphysema, chronic bronchitis, and heart disease, in which the lungs are unable to perform a sufficient amount of work to purify the blood, as indicated by lividness of the face and lips, together with other symptoms of insufficient respiration, great relief may often be afforded by the employment of artificial respiration. What is known as Sylvester's method, elsewhere described, may be employed, or better, the following method suggested by Dobell, an eminent English physician: Place the patient in a chair, let a strong attendant stand behind him upon a stool, elevated just sufficiently to give him command over the shoulders of the patient without stooping forward too much. Let the attendant place his hands in front of the patient's shoulders, taking hold in the axilla beneath them. Now let him lift the patient steadily upward sufficiently to raise his weight off the chair upon which he is sitting. After retaining this position for a few seconds, he should be let down slowly. After resting a few seconds, the operation should be repeated. The patient should be instructed to

respire with the motions of the attendant. By the repetition of this exercise for half an hour, the patient's condition will, in many cases, be very much improved, the livid appearance of the face and lips disappearing, and not infrequently the fatal moment may be long postponed. By a continuance of these measures at frequent intervals, for a few days, it may be deferred for weeks and often for months and years. It is quite probable that many patients die from carbonic acid poisoning who might be saved by the adoption of these measures, if they were thoroughly applied.

Sneezing.—This symptom consists in an explosive expiratory effort, the air being expelled through both the mouth and nose, but chiefly through the former. It is oftenest occasioned by irritation of the nasal and mucous membrane. It may arise from titillation, inhalation of dust, congestion incident to taking cold, or congestion present in influenza and hay fever. It is, in some cases, a purely nervous symptom. With many persons, sneezing is excited by looking at the sun or at a bright light.

Treatment.—This symptom rarely becomes so troublesome as to require special attention by way of treatment, and yet it is often at least convenient to be possessed of a remedy to check or relieve it. The disposition to sneeze can ordinarily be relieved by rubbing the nose between the thumb and finger. It may also be checked by pressing the finger against the upper lip, just below the nose. In some cases, the nasal douche, administered with a fountain syringe, is essential. The best solution employed is a teaspoonful of common salt, dissolved in a pint of tepid water, or fifteen to twenty drops of carbolic acid, well dissolved.

Hiccough.—This symptom is produced by a sudden spasm of the diaphragm. It may be excited by eating too much, thus causing indigestion and irritation of the stomach, drinking a large quantity of cold water, or by long-continued and immoderate laughter. It also occurs, sometimes, in the last stages of wasting diseases, when it is regarded as a very grave symptom, indicating approaching dissolution.

Treatment.—Hiccough can generally be stopped by taking a very small sip of very cold water or swallowing a small piece of ice. It may also generally be checked by holding the breath a long time, so as to interrupt the paroxysm, which occurs at regular intervals. When it is very obstinate, and is evidently the result of indigestion, a copi-

ous warm water emetic should be administered for the purpose of emptying the stomach. In ordinary cases, the symptom will disappear of itself, after a short time.

Foul Breath.—Although this symptom does not necessarily pertain to the respiratory organs, it may be considered here, perhaps more properly than in any other connection. Foulness of breath may arise from decaying teeth, ozena, ulceration of the tonsils, foul emanations from the stomach, and from the fetid expectorations of consumption in its advanced stages, or cases of chronic bronchitis in which there is great dilatation of the bronchi, allowing accumulation and decomposition of purulent secretions of mucus.

Treatment.—Decaying teeth should be cleansed and carefully filled. Catarrh, attended by fetid secretions and ulceration of the tonsils, should receive the necessary treatment. Foul emanations from the stomach may be best corrected by the adoption of such measures as will improve the digestion. The use of charcoal either in capsules or in the form of charcoal tablets, is an excellent measure for temporary relief. The fetid odors arising from decomposing secretions in catarrh, bronchitis, consumption, and in gangrene of the lungs, may be in a great degree corrected by the inhalation of carbolic acid vapor. A few drops of pure carbolic acid or creosote, say four to six drops of either, should be placed in the inner cup of the steam inhaler, shown in Fig. 274, and inhaled three or four times a day.

DISEASES OF THE CIRCULATORY ORGANS.

The Pulse in Health.—The pulse is about 120 to 140 at birth. It gradually diminishes until it reaches about 90 at the age of seven or eight years. In adult life it is 65 to 75, and in old age not much over 60. Females have a somewhat more frequent pulse than males, the difference being five or six beats a minute. A difference of five to ten beats is made by changing from a lying position to sitting, and from sitting to standing. By violent running the pulse may be increased to 160 or more.

The pulse is felt by placing the first two fingers upon the artery at the outside of the arm, with the second finger toward the heart. The force of the heart is determined by pressing with the second finger and noticing how much force is required to compress the artery so that the pulse cannot be felt by the first finger. The pulse may also be felt at the temple, the neck, and in various other situations.

The Pulse in Disease.—The following are the principal varieties of the pulse :—

Frequent Pulse. A pulse diminished in force, increased in frequency. A characteristic of debility.

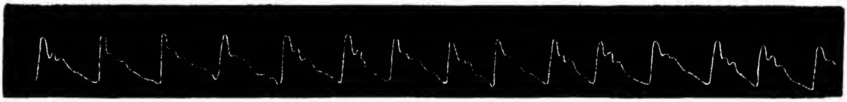


Fig. 315. Pulse of a Healthy Person.

Febrile Pulse. In fever, the rate of pulsation and usually also the force is increased.

Feeble Pulse. A pulse that is readily extinguished by pressure with the finger. Indicative of great debility or exhaustion.

Pulse of a Tobacco User. Pulse of a Drunkard.

Fig. 316.

Thready Pulse. A pulse which gives the sensation beneath the finger of a vibrating thread. Present in cases of very great debility.

Slow Pulse. An unnaturally slow pulse occurs in cases of brain poisoning or apoplexy ; it is present in compression of the brain from fracture, and in unconsciousness from opium or liquor.

Quick Pulse. An abrupt, jerking pulse, either frequent or moderate in rate of pulsation.

Hard Pulse. A pulse which seems to indent the finger. Indicates great excitement of the circulation.

Intermittent Pulse. A pulse which now and then loses a beat. Indicative of either functional or organic disease of the heart.

Irregular Pulse. A pulse which is irregular in frequency and force. The irregularity may be only slight, or may be extreme. Is generally found in heart disease. Is very often the result of the use of tobacco and of strong tea and coffee. Figs. 315 and 316 show the contrast between a healthy pulse and the irregular pulse of a tobacco-user and a drunkard, as indicated by the sphygmograph.

Irritable Pulse. A pulse which is both frequent and hard.

Wiry Pulse. A pulse which gives the impression of a vibrating wire.

Palpitation of the Heart, as will be further explained elsewhere, is an excessive action of the heart. Throbbing at pit of stomach is usually due to palpitation of the aorta.

Hemorrhage as a Symptom.—Hemorrhage, not from a wound, is generally caused by a diseased condition or morbid state of the blood-vessels. Spitting of blood may indicate hemorrhage from the stomach or lungs, or simply from the nose or mouth. Nosebleed is most often indicative of congestion of the head. It is a bad symptom when occurring in a person who is very feeble from a wasting disease. Hemorrhage from the bowels is a very grave indication when it occurs in connection with dysentery or typhoid fever ; but it is generally indicative of nothing more than the rupture of a dilated vein in the rectum, due to piles or hemorrhoids. Bleeding from the bladder may indicate disease of either the bladder or the kidneys. Hemorrhages into the skin occur in *scurvy* and *purpura.*

HYPERTROPHY, OR OVERGROWTH OF THE HEART.

SYMPTOMS.—Heavy beating of the heart; visible pulsation of the arteries; ringing in the ears; spots before the eyes; dizziness; in severe cases, apoplexy.

This is a disease which may exist for many years without its presence being manifest by symptoms sufficiently severe to attract attention.

Causes.—The most common cause is disease of the valves of the heart, which interferes with the passage of the blood through its cavities into the arteries. It occurs most frequently in professional runners, oarsmen, and bicyclists.

Treatment.—The treatment of the disease consists in an abstemious diet, excluding all alcoholic drinks, condiments, excess of animal food, tea, coffee, tobacco, and stimulants of all kinds ; overeating, and the use of hot drinks, or excessive drinks of any kind must also be avoided. In Germany, where it is frequently the result of high living and the use of beer, the "whey cure" and "grape cure" are particularly noted as effective means of treating this affection.

In the first of these methods, the patient is made to subsist almost wholly upon the whey of milk. The grape cure consists in confining the patient to the use of grapes almost exclusively. He is allowed to take from three to six or eight pounds of grapes each day. The water cure, even as practiced in the old-fashioned water-cures of Germany, is also advantageous. The essentials of treatment, in addition to careful dietetic measures, are the wet-sheet pack and warm full bath, repeated as often as the patient will bear without much reduction of flesh or strength. If there is a great degree of plethora, the patient being full-blooded, with excessive redness of cheeks and lips, such measures as the pack, full bath, and wet-hand rub may be repeated daily for several weeks without detriment. Another excellent measure, suggested by Prof. Niemeyer, is wearing constantly over the region of the heart a small bag filled with iced water. Frequent changes of the water would of course be required in order to continue the efficiency of the remedy. Rest in bed is the most essential of all measures of treatment, until the pulsations become normal in force and frequency. Centrifugal friction is also useful for quieting an excessively active heart. Mental as well as physical excitement must be avoided.

DILATATION OF THE HEART.

SYMPTOMS.—Small, feeble pulse, frequency increased on slight exertion ; enlargement and pulsation of the veins of the neck ; congestion of the lungs, liver, kidneys, and stomach ; dropsy ; distress in the region of the heart ; shortness of breath continually, preventing the patient from lying down ; angina pectoris ; impulse of the heart diffused over a large space.

Causes.—Dilatation of the heart is most often the result of disease of the valves of this organ. It usually follows enlargement of the heart, the walls, after becoming thickened, being stretched until they are thin and feeble. Enlargement of the heart from any other cause than valvular disease, may also be followed by dilatation.

Treatment.—The treatment of this disease consists chiefly in improving the patient's condition as far as possible, by the avoidance of stimulating foods and drinks, especially by total abstinence from tea, coffee, tobacco, and alcoholic drinks. All depressing influences, especially sexual excesses, and violent exertion of all sorts, should be carefully avoided. The disregard of this caution has frequently occasioned rupture of the heart, and sudden death. The application of electricity to the spine, to the neck, and over the region of the heart, is an excellent measure of treatment, and will, perhaps, accomplish as much as any other one remedy. Rest in bed and careful applications of massage and manual Swedish movements, as directed in the author's work on this subject ("The Art of Massage," Modern Medicine Pub. Co., Battle Creek, Mich.) are essential to successful treatment.

FATTY DEGENERATION OF THE HEART.

SYMPTOMS.—Slow and feeble or irregular and frequent pulse; shortness of breath on exertion; occasional pain in the region of the heart; attacks of faintness or unconsciousness, somewhat resembling apoplexy; sometimes presence of arcus senilus, or white ring around the edge of the cornea.

There are two kinds of fatty degeneration of the heart, one in which the heart is overloaded with fat, and the other in which the muscular fibres of the heart are replaced by fat.

Causes.—The principal causes of both varieties of fatty degeneration are gluttony, the use of alcoholic drinks, and excessive use of fat foods. It is also sometimes the result of Bright's disease of the kidneys and poisoning with phosphorus.

Treatment.—The great danger to be apprehended in this disease is sudden rupture of the heart, upon a slight exertion, on account of the weakening of its walls. If the disease has not existed too long a time, a cure may take place through careful attention to diet and hygienic rules, together with an avoidance of the special causes which may have produced the affection. The patient must also avoid all violent exercise of all sorts. He should not allow himself to become excited or angry under any circumstances, as a fit of anger is as dangerous for him as a dose of poison. Violent exercise of all sorts, as in lifting heavy weights, running to catch a train, hurrying up stairs, or straining to relieve the bowels in constipation, must be carefully avoided. Sugar, fat, all condiments, must be thoroughly discarded.

PERICARDITIS—INFLAMMATION OF THE HEART-CASE.

***SYMPTOMS.**—May be slight; if severe, high fever, pain over the heart extending to the shoulder-blade, collar-bone, shoulder, and down the arm; palpitation; irregular pulse; shortness of breath; patient cannot lie on left side; noises in the ears; nosebleed; cough; debility; faintness; suffocative paroxysms; general dropsy; restlessness; great anxiety; delirium; weakness of heart-beat; rubbing sounds heard on listening over the heart.*

This disease is an inflammation of the sac which contains the heart. It is a very serious disease, and not infrequently ends fatally, although the symptoms are sometimes difficult to distinguish from those of other diseases with which it may be associated.

Causes.—This disease very rarely occurs by itself. It is almost always a part or result of some other affection, as of pleurisy, rheumatism, disease of the kidneys, pneumonia, peritonitis, scurvy, spotted fever, scarlet fever, measles, etc. Rheumatism and pleurisy are the most frequent causes.

Treatment.—The treatment given should be chiefly directed to the removal of the disease of which the pericarditis is a result. The patient should be kept very quiet in bed, carefully protected from drafts, although not overheated by too much clothing, and should be given a nourishing and very simple, unstimulating diet. Fomentations over the seat of the pain, and the continuous use of warm compresses, are perhaps the most useful measures that can be employed. Sometimes the disease is so severe that the heart-case becomes filled and distended with fluid which gradually interferes with the action of the heart, and sometimes occasions death by interrupting it altogether. This may now be relieved by means of the aspirator, though a few years ago it would have been considered the height of folly to attempt tapping of the heart-case.

ENDOCARDITIS—INFLAMMATION OF THE LINING MEMBRANE OF THE HEART.

***SYMPTOMS.**—Palpitation; pain and uneasiness in the region of the heart; fever; restlessness; feeble pulse; shortness of breath; patient insists on lying on his back; peculiar murmurs heard on listening to the chest.*

This disease affects the left side of the heart most frequently, choosing for its principal seat the valves. The result of the inflammation is the production of little warty growths upon the valves, which interfere with their action; but the worst results sometimes occur subse-

quently, from the contraction of the parts affected by the inflammation, causing stiffness and pressure, closure of the valves, and thus obstructing the passage of the blood from the heart. Any one or all of the four valves of the heart may be affected. The usual results of valvular disease of the heart are, enlargement, which is finally followed by dilatation; pulmonary congestion, which results from an obstruction of the free passage of blood from the lungs; congestion of the stomach, liver, spleen, and all internal organs including the brain, from the obstruction of the venous circulation; general structural and functional derangement of all the internal organs; and finally, general dropsy, showing itself first in the feet and ankles, gradually extending to the body, involving the abdominal cavities, chest, and upper extremities, and ultimately resulting in death. One of the immediate dangers in this affection is *embolism*, which consists in the obstruction of the artery with a small plug, which is formed in the heart by the adhesion to the excrescences upon the inflamed valves of portions of the fibrine of the blood, which are after a time dissolved and swept along with the blood current until they reach arteries of so small a size that they are stopped, and plugging the vessel, cut off the supply of blood from the part to which it is distributed. When this takes place in the brain, where it is most likely to occur, symptoms of paralysis appear, as loss of speech or memory of words, etc.

Causes.—This disease, as stated with reference to pericarditis, rarely occurs by itself. It is most often due to rheumatism. It may also occur in connection with inflammation of the heart-case, pneumonia, pleurisy, Bright's disease, scarlet fever, and other eruptive fevers.

Treatment.—The treatment of this affection must be the same as that recommended for pericarditis, together with the treatment necessitated by the disease of which it is the result, or with which it is connected, and that described for valvular disease of the heart.

INFLAMMATION OF THE HEART.

SYMPTOMS.—Weak action of the heart and feeble pulse; first sound of heart weak or absent.

This is an inflammation of the substance of the heart itself. It is a disease of rare occurrence, and most frequently results from the high temperature incident to typhoid and other febrile diseases.

Treatment.—The best treatment for this affection is that of a pre-

ventive character. This consists chiefly in the application, during the fevers which it is likely to follow, of packs, sponge baths, cold compresses, cold enemas, and all other measures which are well known to control abnormal temperature.

VALVULAR DISEASE OF THE HEART.

***SYMPTOMS.**—Palpitation; heavy beating of the heart and shortness of breath, especially on slight exertion or excitement; active congestion of the lungs; congestion and torpor of the liver with jaundice; dropsy; distress in the region of the heart, in some cases angina pectoris; congestion of the stomach, causing dyspepsia; scanty and highly colored urine, sometimes bloody; murmurs.*

The cause and nature of this disease cannot be well understood by the reader, without careful study of the structure of the heart. This we have described in another connection, and would call attention to Figs. 97 and 98, which show one of the valves of one side of the heart, open and closed. Various changes occur which are chiefly due to inflammation; the valves of the heart may become thickened and contracted, so that their function is performed very imperfectly. Two forms of impairment of the valves occur, one which prevents the blood from entering or leaving the cavities of the heart freely, known as obstruction, the other which prevents the complete closure of the valve, and so allows the blood to reenter the heart, after it has once been expelled from it, known as regurgitation. The results of valvular disease of the heart are those which have already been described as resulting from *endocarditis.*

Causes.—Rheumatism and pleurisy are the most common causes of valvular disease of the heart. Old age and syphilis are also productive of disease of the valves.

Treatment.—This disease is one which is by its nature rendered incurable. Nevertheless, much can be done to prolong the life of patients and to add to their comfort. The danger of sudden death is by no means as great as is generally supposed, as very few people suffering with this affection meet with sudden death in consequence of it. It is necessary that persons having valvular disease of the heart should carefully avoid overtaxation of the heart by overexercise, either mental or physical, particularly the latter. They should never indulge in running rapidly, playing games requiring vigorous exercise, or in any exercise whatever requiring violent exertion. All depressing influences, as the use of tea and coffee, tobacco, alcoholic liquors, and especially sexual excesses, should be scrupulously avoided.

Great care should be taken to avoid taking cold, to prevent liability to congestion of the lungs. The dropsy which occurs in the last stages of the disease should be treated by such measures as will excite vigorous action of the skin, as the hot-air and vapor baths, wet-sheet pack, and vigorous friction of the skin. A milk diet has been recommended for dropsy. It is generally insisted upon, however, that the patient shall take a dry diet. We think it a mistake to deprive the patient of fluids, as the blood is so thickened that the vital functions are in some cases interfered with. A moderate quantity of fluid should be allowed. Turkish and Russian baths should be interdicted to the majority of patients. This is especially true of the Russian bath. This should never be taken by persons suffering from serious valvular disease of the heart. Persons suffering from rheumatism should give the disease prompt and vigorous attention, as it is one of the most frequent causes of the malady, and intensifies it by repeated attacks.

EMBOLISM AND THROMBOSIS.

Embolism is the clogging up of an artery by means of a small clot of blood or a fragment of calcareous matter from the heart, fat globules, hydatids or bacteria, which are carried by the current of blood to the point where embolism occurs. *Thrombosis* is a clot formed at the point where it is found. When any blood-vessel is completely closed by embolism or thrombosis, the part to which the blood is distributed, if not supplied with blood in some other way, suffers for want of nutrition. The brain, spleen, kidneys, lungs, and liver are most likely to be affected by embolism. Many years ago we had under our care a patient in whom embolism of the large artery of the arm had occurred, the result of which was complete extinction of the pulse of that arm. As the patient subsequently died from a tumor in the chest, opportunity was afforded for a post-mortem examination. The obstruction was found at the upper part of the arm, the channel from that point downward being wholly obliterated.

Treatment.—It is important that persons who have clots in any large blood-vessels in consequence of an extensive injury or a surgical operation, should keep very quiet until the clots become thoroughly organized or permanently fixed in their location so as to prevent the danger of disengaging fragments and producing embolism thereby. Special symptoms arising from embolism or thrombosis should be treated according to the indications in each case.

RUPTURE OF THE HEART.

This accident occurs in consequence of fatty degeneration of the organ, excessive dilatation, aneurism, and other diseases by which the walls of the heart are weakened. It usually occasions instant death.

PALPITATION OF THE HEART.

This is a functional disorder of the heart, probably dependent upon some sort of disturbance in the nerve centers having control of the organ. It consists in a rapid and disturbed action of the heart so intense as to be painfully perceptible to the patient. The heart, in some cases, seems to the patient to roll or turn over. In some cases there is an interruption of the beating of the heart, one, two, or even three beats being lost. The sensation of the patient during the suspended beating is that he is about to die, so that great alarm is occasioned. The attacks of palpitation usually occur at intervals, the patient in the meantime being wholly free from inconvenience.

Causes.—Exposure to cold, the use of stimulants and of tea, coffee, and tobacco, sexual excesses, dyspepsia, and self-abuse are among the causes of palpitation of the heart. The palpitation also occurs as the result of indigestion or anæmia. Palpitation often accompanies organic disease of the heart. A careful examination should be made to determine whether or not the patient is suffering from valvular disease.

Treatment.—The patient should have tonic treatment, nutritious, careful and regular diet, should abstain from excesses of all kinds, take abundance of sleep, with plenty of out-of-door exercise, and should abstain wholly from tobacco, coffee, tea, and spirituous liquors. Palpitation of the heart is often mistaken for real organic disease of the organ. We have met many cases in which patients supposed themselves to be the subjects of organic disease of the heart on account of the obstinate and long-continued palpitation of the organ. A young man who was under our care a year or two ago was a remarkable illustration of this fact. He had been examined by many physicians, and was by a majority supposed to have an organic affection of the heart. Notwithstanding, the improvement of his digestion caused the entire disappearance of his heart symptoms, and we have every reason for believing that the trouble was wholly functional, though it was so violent as to give him great discomfort and excite alarm. A careful regulation of the diet is in most cases all that is necessary to

effect a cure. The exact nature of the diet should depend upon the particular condition of the stomach. Alternate hot and cold applications to the spine and the application of galvanic electricity to the throat are deserving of strong recommendation as among the most successful measures of treatment in this disease. In chronic cases, relief will be obtained by wearing over the heart a tin or rubber bag filled with iced water, which must be frequently renewed. Sympathetic palpitation may be relieved by bending the head downward, allowing the arms to hang down. The effect of this measure is increased by holding the breath a few seconds while bending over. Another ready means which will relieve most cases very quickly is pressing strongly upon the large arteries on either side of the neck. This generally gives instant relief.

Throbbing at the pit of the stomach is usually due to palpitation of the aorta, caused by irritation of the stomach. It may also arise from aneurism. Palpitation of other arteries, as those of the neck, temples, groins, and other parts of the body, may occur. We recently had under treatment a patient who complained of palpitation in all parts of the body. The local application of cold is the best remedy. In case of aortic palpitation, the ice-pack to the spine may be employed.

ANGINA PECTORIS.

SYMPTOMS.—Intense pain in the region of the heart, sometimes extending down the left arm to the ends of the fingers; a sense of suffocation and of impending death; great pallor of the face; the pulse usually small, feeble, and irregular.

Angina pectoris is a nervous disease of the heart, usually accompanied by fatty degeneration, valvular disease, obstruction of the coronary arteries or arteries of the heart, and various other derangements of the heart and aorta.

Causes.—The direct causes of the disease are not known. Probably they are similar to those which give rise to other obscure nervous diseases.

Treatment.—The most important of all measures consists in the proper regulation of the diet and regimen of the patient during the intervals of the attacks. By this means it may be hoped to ward off the disease. The best remedy for immediate relief of pain is nitrite of amyl, a powerful drug, three to five drops of which should be placed on the handkerchief and inhaled by the patient. Persons subject to these attacks should carry with them a small bottle containing a sponge saturated with the nitrite, which may be placed to the nose when necessary.

BASEDOW'S DISEASE, EXOPHTHALMIC GOITRE.

***SYMPTOMS.**—Remarkably rapid pulse, from one hundred to one hundred and forty a minute; unusual prominence of the eyes, giving them a staring or ferocious look; enlargement of the thyroid gland; debility and anemia; mental depression; nervousness; sleeplessness; in women, amenorrhea.*

This is undoubtedly an affection of the sympathetic nervous system. It is a rare disease.

Treatment.—The disturbance of the sympathetic and vaso-motor systems of nerves, to which this disease is directly due, doubtless arises, in the great majority of cases, from disorders of digestion. The treatment elsewhere directed for dilatation of the stomach should be employed, together with rest in bed, massage, appropriate measures for relief of the bowel looseness, cool sponge baths, general applications of electricity, and especially galvanization of the sympathetic.

ANEURISM OF THE HEART.

***SYMPTOMS.**—The symptoms resemble valvular disease of the heart, with pains much greater than in the latter affection.*

This disease consists in the formation of a sac in the walls of the heart which communicates with the cavity of the organ. The sac frequently increases in size through stretching. It sometimes becomes as large as the heart itself. Fortunately, the disease is quite rare, as it is almost certainly fatal. The principal cause of this malady is rheumatism.

Treatment.—The most that can be done for the patient is to restrain him from all violent exertion and give him a careful, nourishing diet, withholding all alcoholic stimulants, tea, coffee, tobacco, and other narcotics. Perfect rest upon the back in bed for two or three months, and a very meager diet, has been recommended as a means of treatment by a very eminent Irish physician.

DISEASE OF THE ARTERIES.

The arteries are, as a general rule, quite free from disease, but not wholly so. The principal affections are, aneurism and calcification. Inflammation of the arteries is a very rare disease, occurring chiefly in very old age; but sometimes in syphilitic and other affections, a peculiar kind of inflammation of the coating of the arteries occurs. It is followed by a chalky deposit, which is known as calcification of the

artery. We have met many cases in which this process had extended to such a marked degree that the hardened arteries could be felt in various parts of the body, giving to the fingers the sensation of a pipe-stem broken in various fragments. Aneurism of the arteries is a disease which frequently arises from this same kind of inflammation. It is further described in the section devoted to surgery.

INFLAMMATION OF THE VEINS.

SYMPTOMS.—Pain on pressure; swelling and redness following course of vein and extending toward heart; when suppuration occurs, chills and wandering pains; much disturbance of the system.

Inflammation of the veins, or phlebitis, occurs occasionally, though less frequently than was once supposed. It is both a cause and a result of thrombosis. It is a dangerous disease, often causing death. A common form of the disease is milk leg, occurring after childbirth.

Treatment.—The proper treatment, when it is known to occur, is continuous application of hot fomentations. The patient should be kept very quiet, to prevent clots from being dislodged and carried into the circulation.

VARICOSE VEINS.

This is a condition in which the veins are greatly dilated and become tortuous in their course. It is occasioned by occupations which require long standing upon the feet, by constipation, and especially, in women, by pregnancy.

Treatment.—The disease is seldom cured; but its inconvenience may be greatly lessened by the use of the elastic silk stocking or the elastic bandage. The latter measure we very much prefer for the majority of cases. The bandage should be applied from the toes to above the affected part. It should be applied smoothly and with even pressure. Little pressure is required, as the natural swelling of the limb in standing will produce all the tension necessary, although a very slight pressure may be employed in the application of the bandage with the limb in a horizontal position. The patient should take care to keep the affected limb horizontal or slightly elevated as much as possible, so as to encourage the flow of the blood toward the heart. Sometimes the dilation of the vein becomes so great that rupture occurs. In case of such an accident, the patient should at once elevate his limb as high as possible and compress the veins on each side of the point of rupture. A radical cure may be effected by surgical measures employed with strict aseptic precautions.

INFLAMMATION OF THE LYMPHATICS.

SYMPTOMS.—Enlargement of a lymphatic gland, forming a painful lump usually felt in the side of the neck, in the arm-pit, in the knee, or in the groin, from which may be seen radiating reddish lines having a cord-like feeling.

Causes.—A poisoned wound, as a scratch received while dissecting or making a post-mortem examination. Absorption from an ulcer or a malignant disease is a common cause of lymphatic enlargement.

Treatment.—Hot fomentations or warm compresses constitute the best treatment. It should be continued until the enlargement disappears or softens. When softening occurs, the part should be promptly lanced to evacuate the matter contained.

LEUCHÆMIA—WHITE BLOOD.

SYMPTOMS.—Fullness in the left side, due to enlargement of the spleen, or enlarged lymphatic glands; patient pale and weak; nosebleed or hemorrhage from the bowels; at last dropsy, fever, delirium or stupor, and death.

This is a peculiar disease which has been understood only within the last few years. The principal symptom of the disease, aside from those mentioned above, is an increase of white blood corpuscles. These little bodies, which naturally exist in the blood in the proportion of one hundred to three or four hundred of red-blood corpuscles, in this disease become increased to such an extent as to constitute from $\frac{1}{80}$ to $\frac{1}{6}$, and in extreme cases, shortly before death, even one-half of the whole number of blood corpuscles. In these extreme cases the blood has a pale appearance; and after death, whitish clots are found in the heart and large blood-vessels, which look like collections of pus. This disease is becoming more frequent.

Cause.—Nothing is known of the cause of this peculiar malady. It has been observed that it is always connected either with enlargement of the spleen or of the lymphatic glands, from which it is supposed that the great increase in number of the white corpuscles is due to an excessive formation of these bodies by the glands naturally engaged in the blood-making process. There is also evidence that the increase of corpuscles is due to morbid activity in the connective tissue cells in various parts of the body. Cases often occur in which there is enlargement of both the spleen and the lymphatic glands. The spleen sometimes attains the size of seven or eight pounds. In a case of the disease which we met several years ago, the whole left side of the ab-

domen was filled by an enlarged spleen. Lymphatic tumors sometimes reach an enormous size. Enlargement of the spleen from malarial poisoning sometimes results in this disease.

Treatment.—It is fortunate that this disease is extremely rare, as it is equally difficult to cure. The remedies which have been most recommended have been quinine, iron, and preparations of iodine; but Prof. Niemeyer of Tübingen candidly remarks that by this mode of treatment "no case of recovery from leuchemia is known," and that in a case treated by him improvement took place under an opposite mode of treatment. He adds, "I afterward sent the patient to a wa-

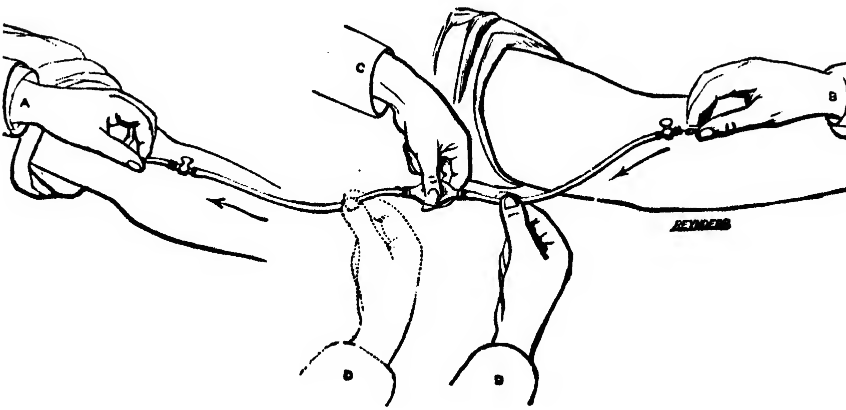


Fig. 317.

ter-cure establishment, where he improved and became healthy looking." Even in this case, the disease returned after the lapse of a year or two, though it is possible it might have been held in check if the patient had continued under proper treatment. All sorts of experiments have been tried in the treatment of this disease. A few years ago, we met a man who had been suffering with the malady for two or three years. After having tried all sorts of remedies, he was at that time drinking warm beef blood every morning at one of the large abattoirs in New York. He had become so disgusted with the remedy, however, that he had made up his mind to abandon it, concluding that the disease with its consequences was to be preferred. Cases of recovery from this disease have been reported to have taken place in consequence of the operation of transfusion of blood. This operation consists in pumping into the veins of the patient a supply of healthy blood from another individual. The blood of the sheep is sometimes used

instead, but human blood is undoubtedly much more effective. The operation is usually performed upon the arm. Fig. 317 shows the simplest mode of procedure. In some cases the blood is drawn from the arm of the individual supplying it, and is deprived of its fibrine by whipping before being injected into the arm of the patient. This plan lessens the danger of formation of clots, but is less effective than the more direct method shown in the cut.

CYANOSIS—BLUE DISEASE.

SYMPTOMS.—Blue or purplish color of the skin, lips, and under the eyes; coolness of the body; palpitation; shortness of breath; bulbous enlargement of tips of fingers and toes; incurved nails; dropsical symptoms.

Cause.—The cause of the peculiar coloration in this disease is some malformation of the heart or its large vessels, by means of which there is a mixture of arterial and venous blood so that the blood is not properly purified. One of the most common causes of malformation is failure of the *foramen ovale*, or the opening through the partition dividing the right and left auricle, to close after birth. This closure generally occurs within a short time after birth, preventing mixture of the blood of the two sides of the heart. When it remains open, the individual becomes cyanotic. Sometimes other malformations occur, such as a transposition of the large arteries, the aorta arising from the right ventricle, and the pulmonary artery from the left, with various other deficiencies and abnormalities.

Transposition of the heart sometimes occurs. A few years ago we had a patient under treatment in whom the heart was found upon the right side, the liver being transposed to the left, and other internal organs, so far as could be ascertained, having undergone the same transposition. No inconvenience was suffered from the peculiarity, the heart apparently performing its function as well as when in its proper position.

Treatment.—Infants, born with the deficiences described, generally die very early. Sometimes, however, individuals affected in this way, have been known to reach advanced life. No special treatment is indicated, as the disease is of an incurable nature; but great care should be taken to protect the patient from all influences which will disturb the circulation in any way. The danger of taking cold should be especially avoided, with exposure to measles, whooping-cough, diphtheria, and all diseases which affect the respiratory organs.

DISEASES OF THE NERVOUS SYSTEM.

The notable increase in the frequency of nervous diseases in modern times gives to this class of affections an importance far greater than has been attached to them at any previous period in the history of the race. A century ago, the literature upon the subject of nervous diseases was comparatively a meager one; but at the present time, there is probably no class of affections which commands a larger share of the attention of medical authors than this. Ziemssen's Encylopedia of Medicine has four ponderous volumes devoted to the subject, and voluminous works on single diseases, or classes of diseases, of the nervous system are becoming very numerous.

The cause of the great increase of attention given to this subject is, without doubt, the great increase in the number and frequency of nervous disorders. The increasing tendency in this direction is a subject of marked concern on the part of many observing and reflecting physicians; and it is a matter of importance to consider briefly, at least, some of the causes which have led to this remarkable development of a special class of diseases in recent times.

Causes of Increased Frequency of Nervous Diseases.— First among the causes which have undoubtedly led to this state of things, may be mentioned the unnatural hurry and bustle of modern life, and the numerous sources of excitement and morbid nervous activity characteristic of our modern times. In business life, the sharp competition of trade is a continual goad to the man whose necessities or ambition lead him to desire pecuniary success. New means of producing various commodities must be invented, and new plans for creating a demand for the same must be devised, giving no opportunity for rest or recreation. In the haste to get rich, men forget the demands of physical law, and commit the grossest outrages against themselves, depriving their overwrought brains and nerves of the proper amount of sleep and necessary relaxation. The desire for speculation has extended till it is no longer confined to the larger centers of trade, but extends to the smallest towns and villages, and often to the most remote country districts.

The hope of amassing wealth suddenly, leads men to incur the risk of losing the results of the small accumulations of years; and while wait-

ing for the turn of the wheel controlled by fickle fortune's caprice, the mental and nervous strain often becomes so great that some of the delicate threads which form the network of this most intricate of all the bodily systems, are snapped asunder, so that pecuniary wealth is only secured at the expense of the most wretched physical poverty. Many times the nervous system, which has, from intense hope and anticipation of greatly desired results, been stimulated to the highest degree, is, by a reversal of prospects, subjected to such a sudden revulsion that the mental and nervous equilibrium is destroyed, perhaps never to be restored. But it is not only in the world of trade and commerce that these disasters occur. In the world of politics, the strain is equally great, and the damaging results of overexcitement may be seen with equal frequency.

So, too, in other departments in life. The scientist is continually taxed to the utmost limit by the endeavor to keep pace with the numerous discoveries and advances which rapidly succeed each other in every department of scientific investigation. The literary student is overwhelmed with the attempt to familiarize himself with even a small fraction of the modern literary productions of merit, to say nothing of the productions of by-gone ages. In social life, competition in dress and display through the desire for social distinction, together with the follies of fashionable dissipation, tell first and most powerfully upon the illy sustained nervous systems of the participants.

In a large number of cases, the foundation for chronic nervous diseases is laid in infancy and early childhood. The popular methods of education, well designated as "school cramming," pervert and overstrain the mental faculties and the nervous system of a large proportion of all who are subjected to the process of being educated. Children are sent to school at too early an age, are kept in school too long at a time and too many hours a day, and are stimulated in every possible manner to exert themselves to the utmost to accomplish in five or six years the mental work which a century ago was not accomplished in ten or twelve. The high schools of the present day present a much more extended curriculum of studies, and require of candidates for examination a degree of qualification far superior to the colleges and universities of the last century; yet it is expected that young men and women will complete their education at an age at which our great grandfathers would have considered themselves well advanced if fairly started.

Everything in modern times seems to be conducive to mental and

nervous overwork. Our railroads enable us to accomplish in a day journeys which would have required a week by the old-fashioned stage-coach. The telegraph and the still more recent telephone are rapidly supplanting the mail system, although in some States mails are carried with almost lightning speed by special trains, which load and unload their bags of letters without checking their speed, even renewing their supply of water in the same way.

Another powerfully acting cause, and, perhaps, one quite as important as any that has been mentioned, is the great and increasing prevalence of the use of various stimulating and narcotic drugs. Alcoholic intemperance produces a distinct class of nervous derangements. The same may be said of opium, of tobacco, and, as can now be clearly shown, of tea and coffee also. The chloral habit threatens to rival the opium habit in its destructive work. It is acquired in the same way and requires essentially the same treatment as the opium habit. The discovery of cocaine added one more to the list of felicity-producing drugs, which quickly enslave the user by the establishment of a necessity for their use. It frequently leads to insanity, and its cure is very difficult. Sulphonal and other allied drugs are coming to be abused in the same manner.

Other injurious habits which are productive of nervous diseases may also be mentioned, [illegible]s in diet, particularly the use of stimulating condiments and of food deficient in nutritive elements, as wheat, deprived of its nerve-nourishing elements, in the form of superfine flour bread; sedentary habits of life; late hours; deficiency of sleep; exciting entertainments; improper dress; novel-reading; sexual excesses and vices; want of control of the passions; all exhausting, depressing, and over-stimulating agencies.

Lastly, we may mention as a cause of the great increase of nervous diseases in modern times, *hereditary influences.* Nervous diseases of all kinds are much more frequent in the developing generation than in their parents. We have many times made the observation that the children of parents addicted to the use of tea and coffee, of tobacco or alcoholic liquors, suffer much more from the effects of these abuses, in various nervous derangements, than the individuals themselves. Through the influence of these hereditary causes, the "nervous temperament" is becoming much more frequent. This fact is true with reference to the severe forms of this disease, as well as those of milder character. The marked increase of insanity in civilized

countries, and the increasing frequency of what is now well recognized as the insane temperament, are evidences of the truth of this.

The only remedies for this disastrous tendency, which, if not checked, is destined to increase with each succeeding generation, is a thorough revolution in nearly all of the habits and practices of modern civilized society. How this might be accomplished, or whether a reform of such magnitude is possible, we will not attempt to say.

PAIN.

Pain is one of the most common of all the symptoms manifested by the nervous system; yet it is impossible to frame a definition which will exactly describe it. Indeed, it is impossible to formulate a definition of pain which will distinguish it from pleasure, the opposite condition. Numerous attempts have been made by philosophers as well as physicians to describe this most common of all symptoms, but without success. Pain may be thus classified: —

Inflammatory Pain.— This is the pain of inflammation, but varies in character according to the part affected and the intensity of morbid action, being sometimes sharp and lancinating, as in the pain of pleurisy, at other times throbbing, as in an abscess in which pus is forming, or dull and continuous, when inflammation is only moderate in intensity and considerable in extent.

Irritative Pain.— This is a pain which arises from some sort of irritation of a nerve. The irritation may be mechanical or chemical, or it may be due to causes too subtle to be discovered.

Reflex Pain.— This variety of pain is felt at some point remote from the location of the morbid condition which gives rise to it. We see illustrations of it in cases of headache, neuralgia, and tenderness of the spine, which arises from disease of the uterus and ovaries in women, and in cases in which pain in various organs is excited by the irritation of worms in the intestinal canal. The most common source of reflex pain is the abdominal sympathetic nerve. Migraine, or nervous headache, neuralgia in various parts of the body, pain in the loins, pain between the shoulders, dragging pain in the abdomen, are examples of common pains which are most frequently due to an excessive irritability of the abdominal sympathetic nerve, arising from disordered digestion or prolapsed stomach or other organs.

Pain Originating in Nerve Centers.—This variety of pain is best illustrated by hysteria, a disease in which the difficulty undoubtedly exists chiefly in the nerve centers, although the exact nature of the diseased condition has not yet been fully made out. Neuralgia of the various parts of the body arising from tumors in the brain is also an example of this kind of pain.

Numerous kinds of pain have been described by various authors, as tingling pain, often referred to as "pins and needles," aching, smarting, burning, gnawing, rasping, throbbing, lancinating, dull, heavy, etc., and various other modifications of pain. It is hardly possible to attach to each of these different kinds of pain a definite significance. It may be remarked that, in general, acute smarting or lancinating pain is indicative of active congestion or inflammation, while a dull, heavy, continuous pain indicates passive congestion.

Causes.—Romberg has very well said, that pain is "the prayer of the nerve for healthy blood." Defective nutrition is undoubtedly the most common cause of pain. We often have very acute pain arising in consequence of a deficient supply of blood to the affected nerve. Congestion is also a frequent cause of pain, the distended blood-vessels subjecting the sensitive nerve fibres to an abnormal amount of pressure.

Treatment.—From the earliest ages there has been an earnest search for a universal panacea for pain. It is universally regarded as an enemy which should be contended against and subdued as quickly as possible. The physiologist, however, regards pain as a friend, since it gives warning of danger, and thus in many cases gives opportunity for averting the threatened calamity to the physical organism. Pain is a sentinel which stands on guard to protect the citadel of life. When the faithful sentinel is lulled to sleep by the devices of anesthesia, a limb may be severed from the body, and the most exquisitely sensitive organs may be subjected to violence without any remonstrance on the part of outraged nature. If anesthesia were the natural condition, life could not long be maintained, for the body would soon be destroyed by the various destructive agents with which it comes in contact. In view of these facts it is evident that before seeking a remedy for the relief of pain in any particular case, the question should be asked, What is the nature and cause of the symptom? In the majority of cases the treatment should be applied not directly for the relief of the pain itself, but for the purpose of removing the cause upon which the pain depends. When this is done, the pain ceases of itself;

whereas, when the opposite course is taken, the sensibility to pain may be obtunded by depriving the nerves of their power of remonstrance while the cause still remains. As a general rule, the large class of drugs which are so extensively used for the relief of pain are utterly worthless as a means of cure, being simply temporary palliatives. In many instances, too, the very drug which relieves the pain temporarily, really increases the difficulty by paralyzing the efforts of nature to remove the morbid cause from which the pain arises.

Cold is generally the most efficacious remedy for the relief of pain when it is produced by active congestion or inflammation. Pain accompanied by a great amount of heat generally calls for the application of cold. Some cases of neuralgia are best relieved by ice or cold compresses. The best remedy for the relief of the pain of a felon before it reaches maturity is immersion of the hand and arm in water as cold as can be borne. Probably there is no one remedy of so universal application as a means of relieving pain as heat. It may be applied in connection with moisture by fomentations, or without, by means of bags filled with hot water, heated sand, corn meal, or some similar substance, hot bottles, bricks, etc. Either moist or dry heat is almost always efficacious in the pain of neuralgia. Pain arising from deficient circulation is also generally best relieved by hot applications. The pain of passive congestion yields to heat quicker than to any other remedy. The severe pain of a felon approaching maturity will often be relieved, as if by magic, by a hot spray or a fomentation. Uterine and ovarian pain are relieved by the hot vaginal douche. Bowel pains are relieved by hot fomentations and by large hot enemas. Severe nervous headache is often best relieved by fomentations or sponging the head with hot water. Fomentations to the bowels are most effective in sympathetic headache. The pain of rheumatism, acute sciatica, neuralgia, pleurodynia and pleurisy, yield best to hot applications. Excruciating pain arising from piles or a fissure of the anus may be often dissipated by sitting over a vessel nearly filled with very hot water. The terrible itching of pruritis and the intolerable pain of earache and toothache also yield to the application of heat. The pain accompanying inflammation of the veins, and the extreme pain and soreness arising from bruises, lacerations, fractures of bones, and many other accidents, are relieved, generally, more readily by the application of heat than by any other means. The warm blanket pack, and the Turkish, hot-air, vapor, and Russian baths, are

most effective means of applying heat. They can be utilized to the greatest advantage in the treatment of cases characterized by pain of a general character. Poultices of various sorts are generally no more effective than fomentations, in some cases less so. Their efficacy is wholly due, in the majority of cases, to the heat and moisture of the application.

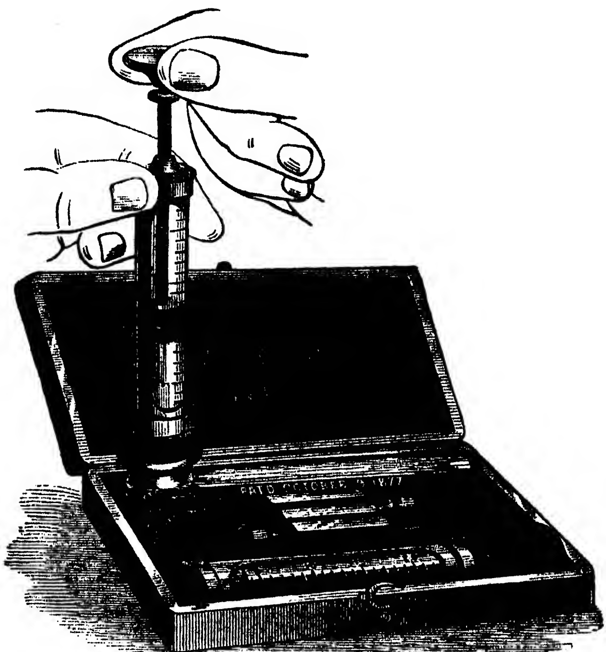


Fig. 318. Hypodermic Syringe.

In exceptional cases, cold compresses will relieve the pains of rheumatism more effectively than heat. Iced water is also sometimes essential as a remedy for the relief of toothache. For congestive headache, ice compresses applied to the head and neck are the proper measures. The terrible pain of cancer may often be relieved by freezing when other remedies fail. This remedy also has the advantage in that it checks the progress of the disease as well as relieves the suffering. The injection of ice-cold water into the seat of pain sometimes relieves the severe pain of neuralgia almost magically. We have used it with fair success in a number of cases. Some recommend injection at the analogous part on the opposite side of the body. Injection is made

by means of the hypodermic syringe, the most approved form of which is shown in Fig. 318. Intense cold or freezing may often be used to advantage to prevent pain in the performance of slight surgical operations.

Electricity occupies a very important place as a remedy for the relief of pain. As a general rule, the galvanic current is more effective than the faradic, though the latter sometimes succeeds when the other fails. Electricity is the most useful in cases not characterized by inflammatory action. In congestion, it gives relief by causing contraction of the distended blood-vessels. As a general rule, the positive pole should be applied at the seat of pain, while the negative sponge is placed near by, at some point below, or at the origin of the nerve of the part. We have found the sinusoidal electrical current of great service in relieving otherwise intractable pain.

Rubbing, gently stroking the part which is the seat of the active pain, will not infrequently secure prompt relief from suffering. This is especially true in the case of headache, pain in the joints, and in some cases of neuralgia and muscular rheumatism. Many popular liniments owe their efficacy almost wholly to the friction with which they are applied. It is well known that a liniment does no good unless it is well rubbed in. A remedy which many years ago was very popular for the relief of pain consisted wholly of olive-oil with the addition of a little beeswax. Gentle stroking of the head and spine will often give more complete relief in severe nervous headache and general nervous irritability than any other remedy which can be applied.

Rest and Position are also effective means of relieving pain in certain cases. Severe headache generally requires a recumbent posture. Pain and neuralgia also demand rest. Pain arising from inflammation in the extremities is generally relieved by elevation of the affected part. It is for this reason that the hand is carried in a sling when a person is suffering with a felon. Pain or chronic ulcer of the leg is also found to be relieved by elevation of the affected limb. Pressure also exercises a favorable influence upon pain in many cases, as seen in the beneficial effects derived from the rubber bandage and the elastic stocking in varicose veins of the limbs. A tight band about the head will sometimes relieve nervous headache when other means fail. Many persons who suffer with headache intuitively hold the head between the hands when the paroxysms of pain are severe.

Pressure upon the affected side of the chest in pleurisy is sometimes very effective in relieving the sharp pain which accompanies respiration in this disease. Pleurodynia also yields to pressure with equal facility.

Diet is in many instances a potent factor in the production of pain, and may be made equally effective in its relief. Abstinence from the use of flesh food will frequently relieve obstinate headaches and neuralgias, especially those arising from congestion. The terrible pain of aneurism of the chest may be relieved by abstaining from fluids as much as possible, so as to diminish the volume of the blood. The suffering from asthma and emphysema is greatly mitigated by the disuse of sugar, starch, butter, and other food elements which are likely to form gases. The pain of ulcer of the stomach may be avoided by resorting to feeding by means of the rectum. Severe pain in the kidneys and bladder is frequently relieved by copious water-drinking. The smarting, burning pain which follows urination when the urine is scanty and high-colored is generally very promptly relieved by this means.

Drugs are to be employed as little as possible for the purpose of securing relief from pain. One reason for this is that in general they do nothing toward removing the cause of the symptom. Another still more important reason is, that, being simply palliatives, a tolerance of their peculiar influence is soon acquired by the system, so that their effect cannot be obtained without steadily increasing the size of the dose. It is through this means that the majority of opium-eaters, hashish devotees, and chloral users are led into the fatal snare. As a general rule, too, the drug employed for the relief of pain when it is long-continued creates a disease often worse than that which it is attempting to cure. In cases of extreme suffering which are not relieved by any measures which have been mentioned, and especially in cases in which the pain is due to an acute cause, which can speedily be removed, or when the patient is suffering from a malady, the nature of which renders it incurable, opiates or any other drugs which will secure relief from suffering may be very properly employed, but should be used entirely under the supervision of a careful and intelligent physician. Nothing could be much more pernicious than the habit which many people have of keeping in the house some anodyne preparation, which generally contains more or less opium, in readiness for use on short notice, whenever any member of the

family may happen to have pain, no matter how trifling may be the degree of suffering. One of the greatest obstacles to be overcome in the treatment of opium-eaters is the lack of fortitude on the part of the patient, a condition which has been brought about by the constant yielding to the disposition to avoid pain, no matter of how slight a character. It is possible for a person to receive injury from the strain upon the nervous system, occasioned by severe pain, but as a general rule, much more injury is done the patient by the drugs employed for the relief of pain than would be occasioned by the pain itself. The drugs which are generally employed for relieving pain not only do not reach the real seat of the disease, but by their paralyzing effect upon the nerve centers, in some degree interfere with the restorative efforts of nature, thus putting a real obstacle in the way of recovery. Opium is especially damaging in this particular. It also has a well-recognized tendency to produce constipation of the bowels, inactivity of the liver, and, in fact, of all the other excretory organs, thus interfering with nutrition and producing a feverish condition of the system. It should be only resorted to as the last of all means for relieving pain. Belladonna, gelsemium, Indian hemp, and other allied remedies, are much to be preferred to opium, although they are somewhat less effective in action. Painful surfaces may frequently be relieved by the application of a solution of glycerine in water or by the employment of simple mucilaginous lotions of various kinds, as linseed tea, slippery-elm water, etc. A solution of tannin in glycerine of moderate strength is sometimes very effective as a means of relieving pain.

VERTIGO.

Dizziness may be the result of too much or too little blood in the brain. It is a very frequent symptom of indigestion, being often caused by gas in the stomach. By pressure of the distended stomach upon the aorta, it interferes with the circulation of the blood in the lower extremities and causes congestion of the head. The use of tobacco, tea and coffee, and alcohol, is a frequent cause of severe, obstinate vertigo. This is especially true of tobacco. Exposure to great heat, either of the sun or other artificial sources, is a cause which is especially active in hot weather. Malaria sometimes produces vertigo. Loss of sleep, overwork, sexual excesses and abuses, and inhalation of impure air are very frequent causes. A few cases have been observed in which

most obstinate vertigo was produced by disease of the ear. It has also in some cases depended upon diseases affecting the heart, brain, spine, kidneys, liver, or sexual organs.

Treatment.—Attention to all the laws of hygiene, avoidance of the known causes, employment of a simple, unstimulating diet comprising but a very small portion of meat, constitute the main essentials of the treatment of obstinate vertigo. When it is induced by congestion, a hot foot-bath should be employed with cold applications to the head, and the patient should sleep at night with his head elevated, and should avoid stooping. When the symptom is due to the opposite condition of the blood-vessels of the brain, or anemia, the patient should remain in a horizontal position as much as possible, and should avoid rising suddenly from a recumbent or sitting posture. Upon the approach of an attack of vertigo, he should lie down at once, or bend the body forward with the head between the knees. Such other measures should be employed as are recommended for cerebral anemia.

NERVOUSNESS.

This is a condition so exceedingly variable in character as to be very difficult of description, yet so common that few are unaware of its nature. It may perhaps be said to be a morbidly sensitive or irritable condition of the nervous system. A person who is nervous, is generally timid, being startled by the slightest noise or unusual circumstance. The unexpected appearance of a friend, the receipt of sudden news, or the occurrence of anything outside of the usual routine, is likely to occasion trembling and perhaps a considerable degree of prostration. Nervous people are generally harassed with apprehensions and imaginary difficulties; the little annoyances of life, which in health pass unnoticed, appear in a greatly exaggerated light.

Irritability of temper, and a disposition to complain, find fault, and scold, are among the features of nervousness. In some people it assumes a form which is sometimes termed fidgets. The patient is unable to sit still or remain in any one position for any considerable length of time. If he sits, he is constantly moving his feet and twisting about in his chair. If he stands talking to a friend, he changes his position every few seconds. When he goes to bed, he finds it difficult to lie still long enough to get asleep, and general restlessness and disquiet keep him in constant motion.

Nervousness is a symptom which accompanies a great variety of

diseases. Though generally looked upon as of trifling importance, it is really a difficulty worthy of serious attention. A person whose nervous system is in a healthy condition is never nervous. One of the most common causes of nervousness is some disorder of digestion. All forms of dyspepsia are characterized by nervousness of a greater or less degree; and in nervous dyspepsia it is one of the most prominent symptoms. An inactive condition of the liver, constipation of the bowels, and in females disease of the womb and ovaries, are morbid conditions in which nervousness is prominent. The use of tea, coffee, tobacco, and alcoholic liquors, is responsible for a very large share of the nervousness which prevails at the present day. Sedentary habits, novel-reading, loss of sleep, dissipation, sexual excesses, and all causes which depress the nervous system are causes of nervousness. Nervousness is a symptom, not a disease.

Treatment.—As nervousness is only a symptom, the first business of an individual suffering from it should be to ascertain its cause. When this is done, injurious influences should be at once removed, and in a majority of cases this is all that is required. When the difficulty depends upon some local or general disease, the morbid condition from which it arises should receive proper attention.

General tonic treatment, especially the use of electricity, massage, and tepid sponge baths, are among the best measures of treatment. Special attention should be given to the diet. It should be unstimulating in character, condiments of various kinds being wholly avoided. As a general rule, meat should be taken in very small quantities, the less, the better, provided the patient has an appetite for other food and is able to digest fruits and grains. A sufficient amount of exercise should be taken in the open air each day, and the patient should have abundant opportunity for rest and recreation.

NEURASTHENIA, OR NERVOUS EXHAUSTION.

***SYMPTOMS.**—Tenderness of the scalp; dilated pupils; headache; pain, pressure, and heaviness in the head; spots before the eyes; noises in the ears; irritability of temper; melancholy; fear of lightning, of solitude, of society, and other morbid fears; nervousness; peevishness; sleeplessness; bad dreams; morbid desire for stimulants; dryness of the skin; swelling of the hands and feet; tenderness of the spine, especially of the lower end; palpitation of the heart; excessive ticklishness; cold hands and feet; nervous chills; in some cases, great debility.*

This disease includes a great variety of conditions which are closely related. Its real nature is a condition of the nervous sys-

tem in which there is a deficient development of nerve force. A patient suffering from neurasthenia may be either thin, pale, weak, or he may be fleshy, muscularly strong, florid, full-blooded. He may be suffering with either hyperemia or anemia of the brain, or may be free from either affection or liable to both conditions in alternation.

Neurasthenia is one of the most frequent of all nervous disorders. It occurs in all grades of society, but is much the most frequent among the cultivated classes. It seems indeed to be rapidly increasing from year to year. Although it cannot be classed with such grave affections as softening of the brain and locomotor ataxia, it is deserving of serious attention, since it not infrequently leads to much more serious disorders, prominent among which may be mentioned the various forms of insanity. In some cases the brain is chiefly affected, while in others the spinal cord seems to be the principal seat of the disease. In still other cases both brain and spinal cord are equally affected.

Causes.—All the general causes of the nervous diseases mentioned at the beginning of this section are active in producing neurasthenia. Among the most important of these may be mentioned excessive mental work, especially when of an irksome or worrisome character, loss of sleep, sexual excesses, especially youthful indiscretions, errors in diet, especially the excessive use of meat and the use of stimulating condiments. Alcoholic liquors and tobacco are exceedingly active causes of neurasthenia in men, while the use of strong tea and coffee are equally active in producing the disease in the opposite sex.

The habitual use of opium, chloral, and other popular remedies for relieving pain and producing sleep, are exceedingly productive of neurasthenia. Any cause which diminishes nerve power by interfering with the nutrition of the nerves, or by occasioning an excessive expenditure of nerve force, may be regarded as a cause of neurasthenia.

Treatment.—Nearly all cases of neurasthenia are curable if the proper conditions and treatment can be supplied; the majority of cases will recover in time with the simple abandonment of all the causes, and careful attention to hygienic measures. When the brain is the chief seat of the malady, the patient will generally be benefited by taking a large amount of exercise in the open air. In cases in which the spine is the seat of the difficulty, equal attention should be given to securing rest. Overexertion and fatigue should be carefully avoided. In the latter class of cases, the diet should be abundant and nu-

tritious, but unstimulating. The best authorities are agreed that a fruit and grain diet is much to be preferred to a flesh diet for neurasthenic patients. In regulating the diet, of course the conditions of the digestive organs must be taken into consideration. As a general thing, the patient may be allowed to take milk quite freely. In some cases milk is especially to be recommended as the chief article of diet. Sweet cream, when it agrees well with the stomach, is an excellent article of food for patients suffering with nervous exhaustion. If the patient is full-blooded and fleshy, a wet-sheet pack, vapor or hot-water bath once or twice a week will be advantageous. When the opposite condition exists, all kinds of reducing treatment should be avoided.

Frequent tepid sponge baths, either with pure water or with a teaspoonful of salt to the pint, is a valuable tonic measure. In most cases a sponge bath can be taken daily with benefit.

Faradization (p. 692) and central galvanization are among the most valuable of all remedial measures. Alternate hot and cold applications to the spine, ice packs of brief duration, and fomentations applied from the spine over the region of the stomach and liver and other painful points, are measures which we have used in many cases with very great success.

Neurasthenia is not a disease; it is merely a group of symptoms pointing to some diseased state. The most common diseased condition present in neurasthenia is a disturbance of the abdominal sympathetic nerve arising from dilatation of the stomach or prolapse of the stomach or bowels. In the treatment of this condition it is, of course, important that the morbid conditions which lie back of it, and not merely the symptoms, should receive treatment, hence special attention should be given to the correction of any indigestion which may exist. If the tongue is coated, an aseptic dietary (see Appendix) and charcoal tablets should be daily used until the tongue has become clean. The bowels must be kept open. If the abdominal walls are relaxed and the abdomen prominent, the Natural Abdominal Supporter (see Appendix) should be worn, and systematic measures, especially exercise, Swedish movements, massage, and the application of the sinusoidal current, should be employed for the correction of these conditions.

It is important to have the thorough co-operation of the patient. It is necessary that his entire confidence should be enlisted. Faith, hope, and will-power will do much toward securing recovery.

CONGESTION, OR HYPEREMIA OF THE BRAIN.

SYMPTOMS.—ACTIVE : ***Wakefulness, or troubled, unrefreshing sleep; bad dreams; confusion of mind, with loss of power of concentration of thought; loss of memory, especially of names; unintentional neglect of most important matters; fullness of the head; headache; sensation of a tight band about the head, with various other strange and peculiar sensations; frequent flushing of the face and throbbing of the arteries of the neck and temples; despondency; morbid fears; peevishness and great restlessness; morbid sensitiveness; dizziness; roaring or other noises in the ears; dread of loud sounds; disturbance of vision by flashes of light, or black spots before the eyes; eyes often red, watery, and sensitive to the light; twitching of the muscles of the face, particularly of the eyelids and corners of the mouth; twitching and cramps in other muscles of the body; in many cases slight difficulty in the pronouncing of certain words or syllables, especially when fatigued; thickness of speech; extremities feel large and awkward; pulse usually slow and full; digestion slow and imperfect; bowels constipated; urine scanty and dark colored.***

PASSIVE : ***Symptoms mostly the same as above, or less marked; drowsiness and unnatural stupor are prominent symptoms.***

Hyperemia of the brain is a much more frequent disease than is generally supposed; in fact, it is probably the most common of all nervous disorders. The failure to recognize this affection in its early stages not infrequently results, from a neglect of proper treatment, in much more serious and frequently incurable disease. There is good reason for believing, also, that this disease in its severer forms is not infrequently mistaken for insanity, patients being confined in lunatic asylums in consequence of temporary mental derangement wholly due to a congestion of the brain, which would readily yield to simple rest, seclusion from exciting causes, and a proper plan of treatment. The symptoms given above are chiefly those which appear in the simpler forms of the disease and in its earlier stages. If the malady is not checked, much more serious results ultimately occur. Among the principal of these are apoplexy, epilepsy, convulsions, and insanity.

Causes.—Active congestion is produced by any cause which occasions the flow of a large quantity of blood to the head. Passive congestion is occasioned by all causes which interfere with the return of the venous blood from the brain. Among the principal causes of active congestion may be mentioned mental overwork, loss of sleep, excessive mental anxiety, and the use of alcoholic liquors, opium, quinine, belladonna, and various other drugs; also certain articles of diet, particularly excessive quantities of animal food, and stimulating condiments, as mustard, spices, pepper, etc. Overeating and eating too fast, by producing

disorders of digestion, are frequent causes of active congestion of the brain. Constipation of the bowels is also a frequent cause, not only by exciting a feverish condition of the circulation, but by occasioning severe straining at stool. Exposure to the rays of the sun in hot weather or to excessive heat at any time when fatigued, frequently produces most severe active congestion. Passive congestion is occasioned by any constriction about the neck, as a tight collar or cravat, by the pressure of the large thyroid gland as in goitre, by tight lacing, and by many of the causes already mentioned. Both active and passive congestion are produced by the various forms of heart disease. Both active and passive congestion are frequently met with in cases of long-standing affections of the stomach, liver, lungs, and other internal organs. Uterine disease is a very frequent cause of cerebral congestion in women.

Treatment.—The sufferer from congestion of the brain should carefully ascertain the cause of the disease, and should then, without delay, change his habits and mode of life, so as to secure the most complete avoidance of all exciting causes. If he is actively engaged in business, he should, if possible, take a journey, leaving all his cares behind. If, however, this cannot be done, or if the case has reached so severe a stage that a journey would be impracticable, the most complete relief from care and seclusion from exciting causes should be secured at home, and an energetic course of treatment should be pursued. One of the most efficient measures for active congestion is the application of ice and cold compresses to the whole head, or to the nape of the neck. Applications should be made once or twice a day, and should be continued from half an hour to an hour at a time. In most cases the cool applications to the head should be accompanied by the hot leg or sitz bath. Wearing of the wet head-cap continually, night and day, for a few weeks is another useful measure. The hot-air bath, wet-sheet pack, rubbing wet-sheet, and the half bath, are also excellent measures. The hot half bath may be used daily to great advantage. Other baths, in case the patient is quite strong, may be used daily for a time, then every other day. In less vigorous patients, such vigorous treatment as packs and hot-air baths should not be employed more often than two to four times a week.

Persons suffering from passive congestion require less vigorous treatment than those suffering with the active form of the disease. In the majority of cases, the proper indications in passive congestion are such as will have a tendency to remove the cause of obstruction to the return

of the blood to the head. We have frequently obtained better results by the employment of hot fomentations to the back of the neck, or between the shoulders, with cold applications applied to the top of the head, than by the use of cold alone.

Galvanism may also be applied with excellent effect in many cases. The best methods of application are as follows: 1. Place the positive pole at the base of the head, and the negative pole upon the spine, six or eight inches below; 2. Place the poles of the battery upon the bony prominences just behind the ears, thus passing the current through the head; 3. Apply the current by the method known as central galvanization, in which the negative pole is placed at the pit of the stomach and the positive at the top of the head—the hair being moistened—the latter, after one or two minutes, being applied to the sides of the neck and the spine.

Sleeplessness is best relieved by the wet head-cap, continuous compress, or cold-water bag applied to the head, and the hot foot-bath, taken at night just before retiring. In many cases, these measures are greatly aided by the application of fomentations over the stomach, and wearing of a wet bandage about the bowels at night. The patient should sleep with his head elevated. In many cases it is better to elevate the head of the bed than to bolster the patient up with pillows. When the bowels are constipated, great care should be taken to keep them open by means of enemas, if necessary. Laxative drugs should not be taken if their use can possibly be avoided; and cases are very rare in which they are really required. The diet should be made as simple as possible, and the patient should avoid overeating, and should masticate his food thoroughly.

In most cases, although the patient may think otherwise, a careful investigation of the digestive organs and functions will show that indigestion has existed for many years. The tongue is usually coated and the bowels constipated. The difficulty is not what is ordinarily termed indigestion, but a condition of general poisoning resulting from the growth of germs in the stomach and the absorption of the poisons produced by them. An aseptic dietary, the use of antiseptic charcoal tablets (see Appendix), regulation of the bowels, and if necessary, the employment of the Natural Abdominal Supporter to support prolapsed organs, will be found the most effective means of cure. When the tongue becomes clean, the sleeplessness will disappear. The mouth should be thoroughly cleansed with some antiseptic dentifrice (see Appendix) before each meal.

ANEMIA OF THE BRAIN.

SYMPTOMS.—ACUTE: ***Fainting; pallor; dilated pupils; pulse weak, frequent, and threadlike; sighing respiration; cold extremities.***

CHRONIC: ***Vertigo; especially on rising from a lying or sitting posture; headache, especially at the top or back part of the head, often confined to a small spot: ringing in the ears; great sensitiveness to noise; in many cases drowsiness in daytime, wakefulness at night; pain in head and eyes, excited by reading; pupils dilated; eyes sensitive to light; nausea and vomiting, sometimes convulsions; great debility; pulse weak, either slow or frequent; palpitation of the heart; symptoms of dyspepsia.***

The symptoms of anemia of the brain frequently resemble so closely those of the opposite condition that the two may be easily confounded. The mistake need not be made, however, if attention is given to the causes by which the condition has been produced. It should also be observed that one of the conditions is usually relieved by measures which aggravate the other; for example, active congestion is aggravated by lying down or stooping forward, while in anemia the symptoms are aggravated by rising up, and are often wholly relieved while the patient remains in the horizontal position. The dilated pupil of anemia is also a characteristic symptom, the pupil being contracted in congestion.

Causes.—Anemia of the brain is most common in women, as congestion of the brain is most frequently met with in men. One of the most common causes of anemia is loss of blood from hemorrhoids, excessive flowing at menstruation or in childbirth, particularly in miscarriage and abortions. It may also be occasioned by hemorrhage from the nose, by great loss of blood in surgical operations, or by accidental hemorrhages. Among other causes may be mentioned exposure to cold; poor food; the use of tobacco; excessive mental work; lack of exercise in the open air; dyspepsia; sexual excesses, especially secret vice; seminal losses; and uterine disorders.

Treatment.—The essential or most important measures of treatment are those which will improve the patient's general nutrition. He should take a very nourishing diet, which may include, with advantage in some cases, a considerable proportion of animal food, in the form of milk and eggs simply prepared. Abundance of sleep should be taken, and the patient should ride out in the open air and sunshine daily, and take other gentle exercises. Care should be taken, however, to avoid actual fatigue, and the patient should, for a time at least, spend the larger share of the twenty-four hours in a horizontal position. A considerable amount of mental exercise may be taken to advantage after

quite a degree of improvement has been secured, except in a few cases in which the affection is the result of mental overwork. The employment of massage, inunction, and applications of electricity to the spine, etc., are beneficial. Dilatation of the stomach and the consequent formation of poisonous ptomaines by the decomposition of food in the stomach and the absorption of these poisons into the system, is in many cases the cause of cerebral anemia and its resultant evils. Prolapse of the stomach is also present. The remedies already given for dilatation and prolapse of the stomach must be employed. An aseptic dietary (see Appendix) is especially important.

APOPLEXY.

SYMPTOMS.—WARNING: *A sensation of weight and fullness in the head; headache and dizziness, especially on stooping; noises in the ears; sometimes temporary deafness; blindness or double vision; frequent nosebleed; nausea; numbness in limbs, especially on one side; incoherent remarks; thickness of speech; drowsiness or stupor; partial paralysis, affecting the face, eyelids, or the limbs; heaviness or stiffness in the limbs; slow and irregular pulse; irritability of temper.*

MODE OF ATTACK: *May begin in three ways. 1. The patient falls suddenly, unconscious and motionless; face flushed; appearance of deep sleep with snoring; pulse full and slow; sometimes convulsions or rigid contraction of the muscles. 2. Sudden pain in the head; faintness; pallor; nausea; sometimes vomiting; sometimes patient falls unconscious; in other cases only slight loss of consciousness, patient suffers with headache and gradually becomes dull, stupid, and finally unconscious. 3. Sudden paralysis of one side; loss of motion but not of consciousness; may come on during sleep, the patient finding one side paralyzed on awakening.*

DURING ATTACK: *Partial or complete unconsciousness; pulse small at first, generally becomes full and strong and usually slow; sometimes interrupted; respiration slow and snoring; froth about the mouth; cold clammy sweat; face pale; eyes dull and staring, usually looking away from paralyzed side; one or both pupils dilated; teeth set.*

The symptoms described vary in different cases, according to the immediate causes from which they rise and the particular part of the brain affected. In the worst cases of apoplexy the injury to the brain consists in the rupture of a blood-vessel, a clot being formed in the brain substance by means of which the function of the affected part is destroyed. In some cases the clot formed is so large, and the consequent injury is so great, that instant death occurs. In other cases, death results after a considerable lapse of time through the suspension of certain important functions. In still other cases, death is occasioned by the inflammation itself set up about the clot, which acts as a foreign body in the brain. This inflammation generally begins within from two to eight days after the attack occurs. The milder attacks of apoplexy are occa-

sioned by the formation of a very small clot or by a sort of concussion of the brain due to sudden and extreme congestion. Cases also occur in which part of the brain becomes suddenly disabled by the blocking up of an artery with a small clot which usually comes from the heart. This is termed embolism.

The symptoms of inflammation sometimes resulting from the formation of a clot, are pain and heaviness in the head, delirium, contraction of the paralyzed limb, especially affecting the flexor muscles, congestion of the face, elevation of the temperature with decrease of the frequency of the pulse and respiration. The apoplectic attack may last two or three hours or several days. It finally terminates in one of three ways. It may gradually pass off within a short time, leaving the patient well or nearly so. It may end in partial recovery, the mind remaining somewhat impaired and some parts of the body paralyzed ; or it may terminate in death. In the majority of cases there is more or less loss of sensation as well as power of motion in the affected parts. Sensibility returns quite early, however, even when muscular paralysis remains.

Among the symptoms which remain in severe cases after the acute attack is over may be mentioned the following: Paralysis of the limbs, usually affecting the side of the body opposite the point of injury in the brain ; that is, if the injury to the brain occurs upon the left side, the paralysis will be upon the right side. The opposite of this is true, however, respecting the muscles of the face. The extensor muscles, or those upon the outer side of the limbs, are generally affected the most seriously. The result of this is contraction of the flexor muscles, which cause various distortions, such as closing of the hand, drawing of the arm toward the opposite side of the body, etc. The arms are generally affected more than the legs; the lower extremities generally recover the most rapidly. According to Trousseau, when the opposite of this is true, the improvement is only temporary, and the patient is almost certain to die within a short time. Paralysis of the tongue is shown by divergence of the organ from the direct line when it is protruded. In severe cases it is protruded with difficulty, and turns toward the paralyzed side. The disturbances of sensation are not always complete paralysis, sometimes being the loss of natural sensibility which is replaced by peculiar sensations, one of the most common of which is that of ants crawling on the skin. This is known as formication. Sight and hearing are sometimes seriously affected. Mental disturbances, sometimes severe, at other times very slight, are generally more or less prominent, being

shown in feebleness of intellect, loss of memory, stupidity, childishness, peevishness, irritability, inclination to weep. Sometimes there is gradual loss of intelligence, resulting in imbecility. Insanity rarely occurs. A very common result is loss of memory of words. The patient seems to be able to think correctly but cannot remember the names of objects. If the name is spoken, he will usually recognize it, but cannot speak the word himself when he wishes, though he may be able to repeat it when he hears it spoken. Numerous examinations after death have shown that in these cases there is an injury of a certain portion of the brain upon the left side which is believed to be, in view of the facts stated, the organ of language. Bed-sores sometimes occur upon the paralyzed side within a few days after the attack. Swelling of the joints is also an occasional result.

A person who has had one attack of apoplexy is more liable to another than if he had not had the first attack, and the liability increases with the number of attacks; but the popular supposition that the third is necessarily fatal is an error.

When the person falls in a fit of unconsciousness, it is sometimes difficult to determine whether he is suffering with apoplexy or with some other affection. In some cases, it is impossible to determine at first the real nature of the attack. The flushing of the face, and the slow, full pulse, will generally distinguish apoplexy from fainting, or syncope. The thermometer also furnishes a means for distinguishing it from deep intoxication, as in apoplexy the temperature is always higher than natural, while in a person who is dead drunk, it is a little below the normal standard.

Causes.—Apoplexy occurs more often in males than in females. With respect to age, the disease is rare before twenty-two years, and increases in frequency with the increase of age from twenty-two years upward. It occurs most often during the cold season of the year, and according to the observations of Sarmani the hours from three to five o'clock in the afternoon, and two to four in the morning, are those in which the greatest number of cases occur. A very important predisposing cause of the disease is a weakening of the arteries of the brain. This is very likely to take place in old age. It is also a very frequent result of the use of alcoholic liquors. The tendency to this disease seems also to be hereditary, although the idea which once prevailed that persons with large heads, short thick necks, prominent abdomens, and a tendency to accumulate flesh, are particularly liable to this affection, is erroneous,

since careful observations show that persons quite the opposite in the particulars mentioned are equally liable. Among the exciting causes may be mentioned, the use of opium, alcoholic liquors, and other stimulants and narcotics; overeating, and the use of stimulating and indigestible food; excessive joy, rage, terror, and other strong mental emotions; great physical exertion; straining at stool induced by constipation; sexual excesses, especially in persons over fifty; tight clothing about the neck; tight-lacing; severe vomiting; hard coughing or sneezing; immoderate laughter; exposure to great heat; prolonged hot baths; cold bathing and heart disease.

Treatment.—We will consider the treatment of this affection under four separate heads as follows:—

1. *Preventive Treatment.*—This consists chiefly in the careful avoidance of all the known exciting causes of the affection. The predisposing causes should also be avoided as far as possible. A person who has an hereditary tendency to the disease should exercise especial care, and avoid every exciting cause, and should especially abstain from the use of all kinds of stimulating food. Flesh diet is especially injurious for such persons. The diet should consist almost wholly of fruits and grains. Milk may be used freely, but eggs and fish should be used only in moderation. Tobacco, alcohol, tea, and coffee should be utterly discarded.

2. *Treatment during the Attack.*—When a patient falls in an apoplectic attack, or is found in a state of unconsciousness exhibiting symptoms of such an attack, energetic measures should be employed at once. To relieve the pressure of blood in the head, ice should be freely applied all about the head, the head being first thoroughly wetted with ice water so as to secure an immediate effect. The shirt collar should be unbuttoned and all clothing about the neck loosened. The head should be raised and the extremities and other parts of the body thoroughly warmed by the application of artificial heat by means of hot bottles, jugs or rubber bags filled with hot water, heated bricks, bags of heated sand or salt, etc.

If the attack is the result of overeating, having followed a heavy meal, an emetic should be given with a large quantity of warm water, so as to prevent violent efforts in vomiting. If the patient does not vomit readily, vomiting may often be induced by tickling the throat with the finger or a feather. Bleeding, a measure so often practiced in apoplexy, is of very doubtful necessity. Trousseau remarks with refer-

ence to bleeding, "No physician, however, thinks of bleeding for the extravasation of blood under the skin, for he knows how perfectly absurd such a practice would be, and would excite an adverse reaction. There is no difference between it and the cerebral clot."

Dr. Hammond says, "I have never bled a patient for cerebral hemorrhage since 1849, and I am sure that I have had no reason to regret the abandonment of the practice." If the bowels are constipated, they should be relieved by a large warm-water enema. If water alone is not effective, strong soap-suds may be employed, or a little extract of senna may be added to the water used. The routine practice of giving a cathartic at once is to be condemned.

3. *Treatment Immediately after the Attack.*— Put the patient in a quiet room. Give him a good nurse and exclude all visitors. Continue the application of cold compresses or ice to the head until the danger of inflammation is past, which will be after seven or eight days; keep the extremities well warmed; relieve the bowels daily or every other day by the use of the enema. If the bladder is paralyzed, the urine should be drawn with a catheter two or three times a day. It should be recollected that in some cases when the bladder is paralyzed there will be continual dribbling of urine. The patient's diet should consist of simple, easily digested food, as milk, oatmeal porridge, simple soups, etc. Rich, stimulating food, especially meat and fats of all kinds, should be strictly prohibited. In case the patient is unconscious and unable to swallow food, he should be nourished by means of nutritive solutions injected into the bowels. See "Nutritive Injections," page 737.

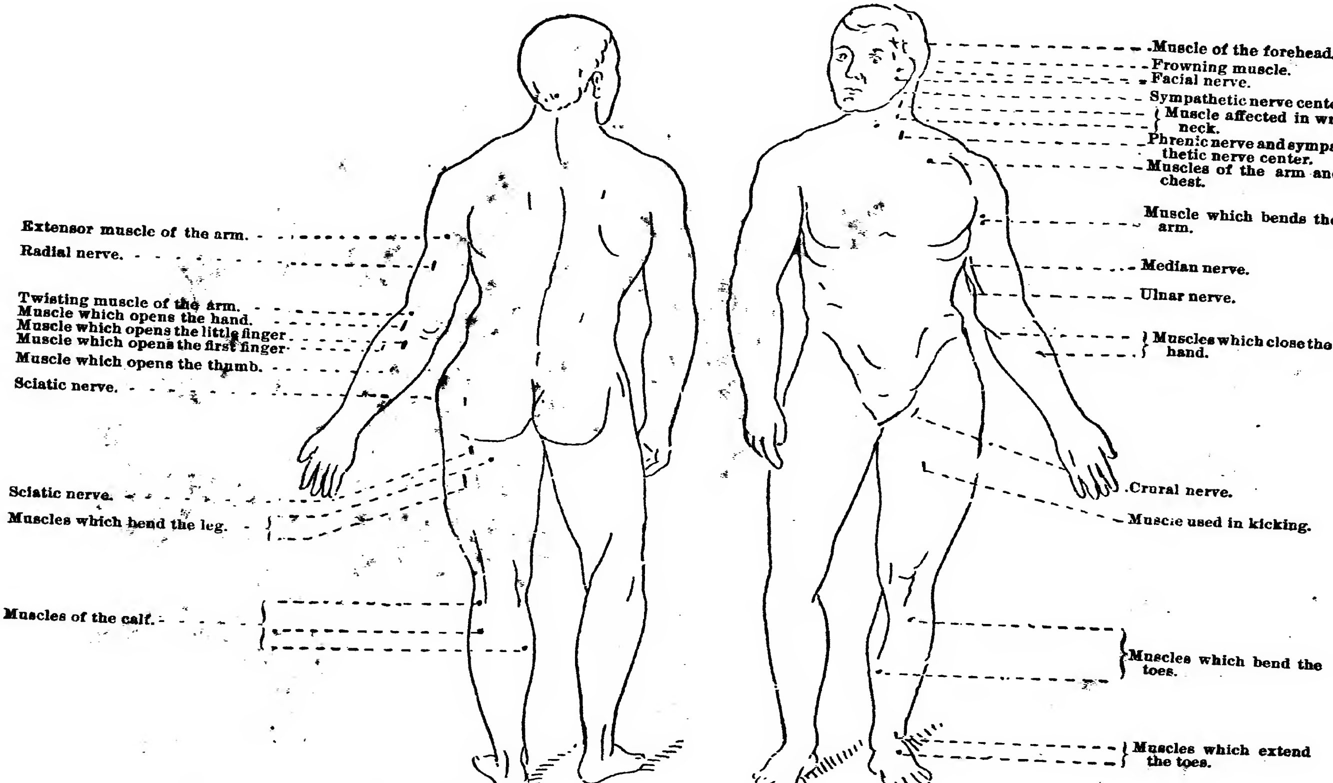
If the fever rises quite high, sponge baths or cool compresses about the trunk of the body should be used as in fever from any other cause. A cool enema taken at a temperature of 65° to 80° is a very excellent means of reducing the temperature in these cases. These measures should be employed whenever marked evidences of fever make their appearance. The use of blisters applied to the wrists, ankles, and calves of the legs, are in the highest degree absurd. The application of the blister to the back of the neck is also of very questionable propriety. Bed-sores should be treated by means of alternate hot and cold sponging applied for 20 or 30 minutes twice a day. They should be covered during the intervals with oiled silk or gutta-percha tissue, smeared with vaseline containing ten drops of carbolic acid to the ounce. See also "Bed-Sores" in section devoted to surgery.

4. *Treatment of the After-Results.*—We consider it specially important that the public should be rendered intelligent respecting this part of the treatment of this disease, as a large share of the cases of paralysis of long standing might have been cured quite rapidly if the proper treatment had been applied at the proper time. No active measures should be employed so long as there are evidences of irritation of the brain or danger from inflammation. By the end of two or three weeks, however, if the patient still remains paralyzed, systematic efforts should be begun, to enable him, so far as possible, to regain the use of his limbs and to prevent deformity. These measures consist, at first, in daily bending and manipulation of the affected limbs. All the joints should be moved to prevent stiffening, and the limbs should be manipulated thoroughly so as to secure a vigorous circulation. Movements described in Figs. 250–266, in the section devoted to "Medical Gymnastics," are particularly adapted to these cases. It is also important that the patient should be required to move his limbs by his own effort as much as possible without too great fatigue. If he is unable to do this, he should be required to make an effort to perform the motion given to the limb by the attendant. The effect will be much the same as if he moved the limb himself with a little help, though he really takes no part in it. This point is quite an important one, as, in many cases, the patient remains paralyzed after the nervous connection which has been interrupted is fully restored, simply from want of voluntary control which has been lost through the long disuse of the affected part. The only way in which this difficulty can be overcome is by the plan suggested. The movements should be applied only five or ten minutes each day at first, but can be gradually increased to fifteen or twenty minutes twice a day.

Electricity is an invaluable remedy in the treatment of paralysis. By means of this agent the paralyzed muscles may be made to contract the same as though controlled by the will. Electricity may be applied in various ways. The most effective mode of application is by means of the sinusoidal current. For general directions for the use of electricity, see pages 692–704. Most of the paralyzed muscles may be made to contract by passing rapidly over them a large sponge electrode, using a current sufficiently strong to produce slight pain or contraction of the muscles. In some cases, however, it is necessary to apply the electric current in a more precise manner by local faradization. This is particularly necessary in a case of long standing

in which the muscles do not easily respond to the stimulation of the electricity. In these cases, one pole of the battery should be placed in the foot-bath in which the feet are also placed, while the other is applied successively to the various points indicated by dots in Figs. 319 and 320. The nerves which control the various muscles of the body are most easily affected at these points. In some cases of paralysis of very long standing, the muscles will not respond to the faradic current until after a more or less prolonged course of treatment. Electricity may also be administered with great advantage by means of the electro-thermal and the electro-vapor baths. When there is a great loss of sensation, it is sometimes necessary to apply electricity by means of a wire brush passed over the skin after it has been thoroughly dried.

Mechanical movements of various sorts, or movements administered by machinery, are in many cases very useful. Baths of various kinds are also of very great advantage, especially daily sponging of the body with tepid water or salt and water. Sponging of the surface of the affected parts with water as hot as can be borne is a very excellent means of restoring lost sensibility. Alternate hot and cold rubbing, employing extremes of temperature as great as can be borne without discomfort, is also a very useful measure. The application of fomentations daily, or every other day, and daily manipulation or kneading of the bowels, is a very good means of restoring the activity of the intestinal canal and relieving constipation. When the skin is dry, inunction with vaseline should be employed two or three times a week. Every possible means should be employed to improve the patient's general nutrition. The diet should be nourishing and unstimulating. The less animal fats and condiments there are taken, the better. The patient should be out into the open air and sunshine as much as possible, and, when practicable, should be given daily sun-baths. Notwithstanding the employment of all the most approved remedial agencies, the most of cases will improve very slowly. Some will make very little improvement. A few will be restored to perfect health, but all, or at least nearly all, cases may be benefited more or less. Even though little improvement should be seen for several weeks, or even months, treatment should be patiently continued with unrelaxing thoroughness, as most remarkable results have often been obtained even when all efforts have seemed to be fruitless for several months. We have treated many cases of paralysis, and have sometimes seen patients recover in a few weeks, while other cases have required as many months to accomplish even a small amount of improvement.



Figs. 319 and **320**, showing points at which electricity should be applied to affect special nerves and muscles.

SUN-STROKE.

SYMPTOMS.— Sudden pain in the head; fullness and pressure at the pit of the stomach; sometimes nausea and vomiting; weakness, especially in the legs; dizziness; sight dim and indistinct; objects appear of one color, usually blue or purple; sometimes convulsions or delirium; insensibility; stupor; snoring or moaning respiration; pulse frequent and weak; skin dry and hot; face flushed or pale.

Causes.—The affection know as sun-stroke is produced not only by exposure to the sun's rays, but by exposure to great heat from any source. Persons employed in glass-works, laundries, and in similar occupations, are subject to sun-stroke or heat-stroke, as well as those who are exposed to the sun's rays. It generally occurs, also, in persons who are debilitated by great fatigue, or who have ceased to perspire. The affection is much more frequent in persons who are addicted to alcoholic stimulants than in others.

Treatment.— When a person falls with sun-stroke, he should at once be carried to a cool, shady place. His clothing should be removed, and cold applications should be made to his head and over the whole body. Pieces of ice may be packed around the head, or cold water may be poured upon the body from a water-pot. The shower pack, described on page 644, is by far the best remedy known for this affection. The great source of danger is the high temperature, which sometimes rises to 110° F. In addition to the measures suggested, the ice pack to the spine and the cold enema may also be employed. In case the face is pale, hot applications instead of cold should be made to the head and over the heart, and the body should be rubbed vigorously.

BRAIN FEVER.

SYMPTOMS.—ACUTE: *Fever; sometimes chill and convulsions; pulse hard and rapid; vomiting; constipation; severe headache, which is aggravated by light and noise; alternate pallor and flushing of the face; eyes red and staring; pupils dilated; delirium; patient cross-eyed; restlessness; muscles twitching; after three or four days, less fever; slow pulse; pupils dilated; stupor.*

CHRONIC: *Symptoms obscure; little or no fever; dullness; change of the disposition; paralysis in some cases; headache and impairment of the mind, following an injury to the head.*

Under the head of brain fever we have included two affections, known as simple meningitis, or inflammation of the membranes of the brain, and cerebritis, or inflammation of the brain substance. Our reason for doing this is that the symptoms of the two affections are

so nearly alike that it is often difficult or impossible for the most careful physician to distinguish between them; in fact, both affections may occur at the same time, thus making the two diseases one. Another form of inflammation of the brain, known as tubercular meningitis, is considered separately. Brain fever sometimes begins very insidiously, the symptoms not being at first sufficiently marked to attract serious attention, so that in many cases the real nature of the difficulty is not understood until the patient has reached an almost hopeless condition. This is especially true of chronic inflammation of the brain, the final result of which is frequently the formation of an abscess. Brain fever beginning thus gradually has frequently been mistaken for insanity, and patients have been taken to an insane asylum instead of receiving proper treatment.

Causes.—The causes of inflammation of the brain are not very well understood, as many cases occur which cannot be traced to any distinct cause. It is known, however, that inflammation of the brain may be excited by blows upon the head, by exposure to the heat of the sun, and by the use of alcoholic drinks.

Treatment.—The essentials of treatment are keeping the patient very quiet in a dark room, and applying cold to the head by means of cloths wrung out of iced water, or ice compresses. In severe cases, the hair should be cut very close, so as to allow of the more complete cooling of the head. Only the most bland and unstimulating food should be taken, and it should be given cold. The cold enema is a very excellent measure of treatment in this and other affections characterized by high fever. In the second stage of the disease, when the pulse becomes slow, the pupils dilated, and the patient dull or stupid, in consequence of effusion into the brain, the treatment should be such as will have a tendency to produce absorption. This can seldom be accomplished, but it will be worth while to make a trial of alternate hot and cold applications to the base of the skull in conjunction with the other measures described.

SOFTENING OF THE BRAIN.

SYMPTOMS.—Pain in the head; dizziness; impairment of intellect; drowsiness; despondency; slow and hesitating speech; loss of speech; prickling and twitching of the limbs; sight and hearing impaired; appetite good; tendency to accumulate flesh; in advanced stages of the disease, sometimes partial paralysis; weak pulse; vomiting; snoring breathing; unconsciousness.

In softening of the cerebellum, usually pain at the back of the head; dimness of vision; paralysis; tottering gait; tendency to walk backwards; dizziness; dullness of hearing.

Causes.—Softening of the brain may result from inflammation, from the cutting off of the supply of blood by an apoplectic clot, or by injury to the skull by a severe blow. It is most likely to occur in old age. We have seen some cases in young men, in whom it was due to self-abuse. It is also produced by the use of alcoholic liquors, and by exposure to intense cold. Excessive brain work has been put down as one of the chief causes of the disease, probably on account of its frequent occurrence in persons who do a great deal of brain labor. We think, however, that this is a mistake. It is more probable that in these cases it is due to sedentary habits and errors in diet, two causes which act together to produce congestion of the brain, and defective nutrition of the organ.

Softening of the brain is by no means so common an affection as is generally supposed. A large share of the cases of so-called softening, are simply active or passive congestion, which in many cases results from sedentary habits and abuse of the stomach. The real disease is a very formidable one, and is seldom if ever cured.

INDURATION, OR HARDENING OF THE BRAIN.

SYMPTOMS.—Shooting pain in the head; trembling of the upper or lower limbs, or of the head; dizziness; melancholy; epileptic convulsions; paralysis occurring in different parts of the body; loss of the sense of touch at the ends of the fingers or toes without the loss of the sense of pain; dimness of vision; impairment of hearing; a stooping attitude; a jog-trot gait.

There are two forms of induration of the brain: in one, the whole brain is affected uniformly; in the other the induration occurs at scattered points through the brain. The symptoms of the first variety of the affection are so nearly like those of softening of the brain that they cannot be distinguished. The symptoms of the second variety, or what is called *multiple cerebral sclerosis*, are those given above. In many cases both the brain and the spinal cord are affected. The disease is quite rare, though we have met with a few cases.

Causes.—This serious affection is attributed to excessive mental strain, long-continued loss of sleep, alcohol, and syphilis. The last two causes mentioned are undoubtedly the most common of all. The hardening effect of alcohol upon the brain and all other soft tissues, is shown by the immersion of the tissues of a dead animal in spirits for a few days. It is well known that when alcohol is received into the system, the brain receives the largest quantity of any organ except

the liver. In cases in which persons have died in a drunken fit, the fluid found in the ventricles of the brain has sometimes shown evidence of the presence of a large proportion of alcohol by bursting into a flame upon the application of a match. In a case which came under our observation a few years ago, the hardening of the brain seemed to be the result of accident. The patient was a lad about seventeen years of age. When a small boy, he had received a blow upon the head, in consequence of a fall. Some months afterward, he began to suffer with epileptic fits, which continued till his death. The development of his body seemed to cease at the same time, although the head continued to increase somewhat in size. The patient lived some years, finally dying of consumption in a state of complete helplessness and imbecility. Upon making a post-mortem examination of the brain, we found it to be hardened throughout to a very remarkable degree. It was also considerably shrunken, the space around it being filled with serous fluid.

Treatment.—Little or nothing can be done to cure or check the progress of this disease, except when it occurs as the result of syphilis, in which case, thorough treatment for the original disease will, in some cases, effect a cure.

HYPERTROPHY AND ATROPHY OF THE BRAIN.

There is some evidence that the brain occasionally becomes overgrown in consequence of disease. This overgrowth does not consist, however, in an increase of the nerve cells and fibers of the brain, but in excessive development of the connective tissue substance of the organ. This condition is known as hypertrophy. Atrophy is the opposite condition, in which the brain becomes shrunken. The symptoms of both affections are so very obscure that they cannot be distinguished, during life, from other diseases. When atrophy affects but one side of the brain, life may be continued many years, as each half of the brain is complete in itself.

TUMORS OF THE BRAIN.

***SYMPTOMS.**—Headache, confined to a small space; constant dizziness; momentary loss of consciousness; roaring in the ears; sensation of ants crawling; numbness in different parts of the body; bright spots before the eyes; irritability of mind; delirium; epileptic convulsions; vomiting; paralysis; loss of vision.*

Causes.—By far the most common cause of tumors in the brain is

syphilis, although the disease may arise from unknown causes. We met with a case of the latter kind a few years ago in which the patient had for a number of years, at intervals of several weeks or months, suffered repeated attacks of what appeared to be a severe form of neuralgia, accompanied by contraction of the muscles of the neck. The disease gradually increased until finally impairment of vision began, and, after a time, sight was entirely lost. The pain in the head now became at times almost unendurable, and resisted all remedies. We pronounced the case one of tumor of the brain, occurring at the base of the skull, at such a point as to press upon the optic nerve. The patient was a native of Switzerland. He returned to his relatives, who took him to several of the principal hospitals of that country, to consult the eminent physicians in charge. Our diagnosis of the case was confirmed, and the case pronounced a hopeless one. The patient was still living the last we heard of him, several years after he returned to his native country, but was in such a sad condition that he was expected to die at almost any time.

Treatment.—As might be readily supposed, treatment is of little consequence in this affection. The most that can be done is to give attention to the patient's general health, and palliate his symptoms as much as possible.

SPINAL MENINGITIS.

SYMPTOMS.—High fever; wakefulness; burning pain in the spine, extending to the limbs, which increases by pressure; spasm of the muscles of the neck and back; sometimes head drawn back; weakness of the lower limbs or partial paralysis; difficulty in breathing; sense of constriction in the neck, back, and abdomen; retention of urine; priapism; obstinate constipation, followed by diarrhea; great prostration, sometimes delirium and unconsciousness.

This disease is an inflammation of the membranes of the spinal cord. It is a very serious malady, but, fortunately, is not very common. The most frequent causes are injuries to the spine, Pott's disease, rheumatism, and exposure to severe cold and wet. Inflammation of the spine also occurs in *cerebro-spinal meningitis*, a disease which is considered under the head of infectious diseases.

This disease sometimes occurs in a chronic form, which may succeed an acute attack, or be developed gradually. The symptoms are essentially the same as in the acute form of the disease, though less marked.

Treatment.—The patient should be kept very quiet in bed, and should take a simple, unstimulating diet. Fomentations, and alternate hot and cold rubbing of the spine, together with warm applications to the extremities, constitute the best treatment. If the bowels are constipated, they should be relieved by enemas. Care should be taken that the bladder is relieved regularly two or three times a day. In chronic cases, galvanism should be applied to the spine, one pole being placed at either end of the spine, and faradic electricity should be applied to the paralyzed muscles. The two kinds of electricity should be used alternately, each three times a week.

INFLAMMATION OF THE SPINAL CORD—MYELITIS.

SYMPTOMS.—Slight fever; dull, aching pain in the back; gradual loss of motion and sensation in the limbs; loss of control in the bladder and rectum; sensation as of a cord tied around the body; tenderness of the spine; pain induced by applying a hot sponge over the seat of disease; formation of bed-sores; prickling; sensation of cold and heat; numbness; nervous sensations in the limbs.

This affection is an inflammation of the substance of the cord itself. Suppuration, softening, or induration may result. The disease is generally caused by exposure to great heat or cold, or by sexual excesses. The most that can be done is to palliate the patient's sufferings by good nursing, as there is no known remedy by which a cure may be effected, yet under appropriate treatment a considerable degree of improvement may be secured.

A form of inflammation of the spine which occurs in small children is a cause of infantile paralysis, under which head it is considered in the section devoted to diseases of children.

PARALYSIS OF THE LOWER LIMBS—PARAPLEGIA.

SYMPTOMS.—Weakness; numbness; tingling in feet and legs, increasing to complete loss of sensation and motion; paralysis of the bladder and rectum; urine bad smelling from decomposition in the bladder; cramps; twitching of the limbs; great debility.

Causes.—Paralysis of the lower part of the body may result from inflammation of the spinal cord or its membranes, from congestion or anemia of the cord, from apoplexy or from an injury.

Treatment.—When it is due to acute congestion or inflammation, cold should be applied over the affected part by means of ice compresses or the spinal ice-bag. If the difficulty is due to an opposite condition, fomentations, alternate hot and cold applications, and the appli-

cation of ice three or four times a day, four or five minutes at a time, are among the useful measures. When the disease is chronic, galvanic electricity may be applied to the spine with advantage, and the limbs should be daily exercised by means of thorough friction and massage, and should be treated two or three times a week with faradic electricity. Local applications of faradic electricity to the rectum and over the bladder should be applied as a means of restoring power to those parts when paralyzed. We have sometimes obtained excellent results by this mode of treatment.

SPINAL IRRITATION, OR SPINAL ANEMIA.

SYMPTOMS.—Tenderness of the spine, at one or more points, which is increased by pressure; pain produced in the spinal cord by percussion and by motion of the spinal column; vertigo; headache; noise in the ears; disturbed sleep; neuralgic pains in the back and chest; neuralgia of the stomach; nausea and vomiting; heartburn; palpitations; difficulty in breathing; pain beneath the breast; pains in the lower limbs; difficulty in urination; ovarian pain.

This affection is a very common one, especially among women. We do not, however, consider it to be a primary disorder, as we have never yet met with a case of spinal irritation in which there was not some affection of the digestive, generative, or other organs to which it could be fairly attributed. The morbid condition in this affection is supposed to be lack of a proper quantity of blood, and deficiency in the quality of the blood circulated through the spinal cord. The pain is located almost wholly external to the spinal cord. It is, as was just mentioned, symptomatic of other internal affections.

Causes.—Sexual excesses of various kinds, particularly self-abuse, is one of the most common of all the causes of this disease. We have met many cases in which the disease was produced by the last-mentioned cause in both sexes. One of the most marked of these we may be pardoned for describing in some detail.* The patient was a young lady from a western city, whose adopted parents, after consulting many different physicians for a peculiar disease of the breast, placed her under our care. We found her a good-looking young woman about seventeen years of age, rather pale and considerably emaciated, very nervous and hysterical, and suffering with severe pain in the left breast, which was swollen to nearly double the natural size, hot, tense,

---

*This case we have more fully described in a work entitled, "Plain Facts for Old and Young."

pulsating, and extremely tender to the touch. Occasionally she would experience paroxysms in which she apparently suffered extremely, being sometimes semi-conscious, and scarcely breathing for hours. The spine was also extremely sensitive to the touch. We suspected the cause of these peculiar manifestations at the outset, but every suggestion of the possibility of the suspected cause was met with a stout denial and a very deceptive appearance of innocent ignorance on the subject. All treatment was unavailing to check the disease. Though sometimes the symptoms seemed to be controlled, a speedy relapse occurred, so that no progress toward a cure was made. Finally our conviction that our first impression respecting the case was correct became so strong that we hesitated no longer to treat it accordingly. By most vigilant observation, evidences of the soul-corrupting vice were detected which we considered unmistakable, and then the young woman, who had pretended such profound ignorance of the matter, confessed to an extent of wickedness which was perfectly appalling. Every paroxysm was traced to an unusual excess of sinful indulgence. So hardened was she by her evil practices that she seemed to feel no remorse, and only promised to reform when threatened with exposure to her parents unless she immediately ceased the vile practice. In less than ten days the mysterious symptoms which had puzzled many physicians disappeared altogether.

In nearly all cases of spinal irritation there is to be found extreme tenderness of the abdominal sympathetic nerve, the result of dilatation or prolapse of the stomach or bowels, or of irritation arising from disease of the genital organs, or of indigestion.

Treatment.—The proper plan of treatment consists in removing the causes, so far as possible, by the employment of such remedies as will improve the general condition of the patient, and the application to the spine of such remedies as will increase the quantity of blood circulating through it. The best remedies for this purpose are the use of fomentations to the spine, and galvanism. Fomentations should be applied for an hour or two at a time, and several times a day. The hot-water bag is an excellent means of applying heat. Hot sand bags or bags filled with heated corn-meal or salt, are also also convenient methods of applying it. Galvanism is, however, by far the best means, when it can be employed. It may be employed in two ways: first, with the two poles at equal distances above and below the tender portion of the spine; and, secondly, with the posi-

tive pole directly over the seat of pain, and the other at a little distance either above or below. The application should not be continued more than two or three minutes at a time without interruption, and not more than twelve or fifteen minutes altogether. Electricity may be used daily with advantage. A burning sensation in the feet and limbs may generally be relieved by the application of the tepid compress over the tender portion of the spine several hours daily.

The disease is, in some cases, very obstinate, but may be considered as curable in almost every case, if the treatment is continued a sufficiently long time. Rest in bed, with massage, is, in most cases, a very essential measure of treatment.

The diet of the patient should be very simple and unstimulating. Kumyss may be used freely, together with fruits and grains.

Fomentations to the spine, the hot spine bag, and support of the abdomen by the Natural Abdominal Supporter, are the most valuable means in the treatment of this condition. Spinal irritation is not a distinct disease; it is merely a symptom; and in the great majority of cases the pain in the spine is due to dragging of the abdominal viscera upon the solar plexus or the abdominal sympathetic. We find in all cases of this disease, a painful spot on either side of the umbilicus, when the tenderness of the spine is located in the lumbar region, and tenderness at the epigastrium, or pit of the stomach, when the irritation is located in the upper part of the spine. Relief of the irritation of the lumbar ganglia of the abdominal sympathetic and the solar plexus, indicated by the tenderness and pain elicited by pressure upon the points named, is the only method by which complete and permanent relief from the spinal irritation can be secured. Treatment of the spine alone is of little or no value in these cases. We have cured many cases by the simple application of fomentations to the abdomen, in which blisters, and even the application of the hot iron, have been applied to the spine without benefit. Carefully graduated exercises and manual Swedish movements are in many cases necessary for a permanent cure.

LOCOMOTOR ATAXIA.

SYMPTOMS.—Begins with dull, heavy pain in the small of the back, pain shooting down the limbs; sensation of a cord tied around the body; or, it may begin with vertigo, epileptic fits, various disturbances of the sight, or contraction of the pupils. When fully developed, disorders of motion; loss of sensibility; toes feel too large for the shoes, or as

if there was something between them or under them; burning pain in the soles of the feet; prickling and numbness in the limbs; pricking of the skin of the limbs not felt as soon as usual; sense of touch diminished; patient feels as though walking on bladders; cannot stand still with eyes shut; difficulty in guiding the feet; in walking, feet placed with flapping motion; cannot walk in the dark or without looking at the feet or ground; diminished sensibility in the fingers; patient cannot button clothes, pick up a pin, or touch the end of the nose readily with eyes shut; in advanced stages, the bladder and rectum become paralyzed.

This disease is a very peculiar affection. It often begins so stealthily that it is frequently quite advanced before its real nature is recognized. Its most characteristic symptom is the manner in which the patient walks, which resembles the gait of a drunken man.

Causes.—Probably the most powerfully acting causes of this disease are sexual excesses and the use of alcoholic liquors. There are also grounds for strong suspicion that it is one of the evil results of the use of tobacco. Syphilis is another cause which is active in quite a proportion of cases. There are other obscure causes.

Treatment.—This disease is a very obstinate malady, often resisting every measure of treatment, although it is very slow in its progress, generally requiring from five to ten years to complete its course, and in many cases a much longer time. The best remedies are rest, careful diet, daily employment of galvanism, and hot and cold applications to the spine, hot sponging, and the application of faradic electricity to the affected muscles, and massage. By the use of these measures, we have succeeded in greatly relieving cases in which other remedies had been tried in vain. The treatment must be persisted in for a long time, although little or no improvement is seen, in the hope of checking the progress of the disease if nothing more is accomplished.

NEURALGIA.

SYMPTOMS.—Pain either constant or intermittent; may be continuous with frequent exacerbations; when it occurs in paroxysms, is described as darting, tearing, or lancinating, and is often very severe; an attack may last a few minutes, or may continue several days; pain usually follows the course of the nerve, along which small, tender points may be felt on pressure with the end of the finger; pain is generally shifting, changing from one nerve to another; it is usually confined to one side; there is, generally, no fever.

Causes.—The principal cause of neuralgia is defective nutrition of the nerves. Romberg has very aptly said that pain is "the prayer of

a nerve for healthy blood." Disorders of digestion are very often accompanied with neuralgia in various parts of the body. The same is true of anemia, which in many cases also depends upon derangement of the digestion. Neuralgia may also be caused by pressure of a tumor upon a nerve trunk, by the contraction of a cicatrix, or scar, in which the end of a nerve trunk is entangled. In malarial diseases it is often due to malarial poisoning. In cases in which it is due to malaria, the paroxysms generally occur at regular intervals. Neuralgia is one of the symptoms of lead poisoning. High living, particularly the excessive use of meat, may be fairly set down as one of the causes of this affection. It may also frequently be the result of taking cold, or exposure to cold, of dissipation, loss of sleep, and especially the use of tobacco, alcohol, and of tea and coffee.

Treatment.—Improve the patient's general health by a wholesome, simple, and nutritious diet, and the employment of tonic baths, as a daily sponge bath, and massage in feeble cases. The use of electricity by general faradization two or three times a week, sunbaths, exercise in the open air, and all other known means is of first importance in the treatment of this disease. Ordinary neuralgia may almost always be relieved by either moist or dry heat. In some cases, cold applications give more relief than hot. As a rule, abnormal heat requires cold, and unnatural cold requires hot applications. In many cases, it is also necessary to give the patient a warm bath of some kind. The Turkish, Russian, hot-air, electro-vapor, and electro-thermal baths are particularly useful in these cases. A blanket pack is also a very excellent remedy which we have used many times with success. Probably the best of all known means for relieving neuralgia is the use of electricity. It often succeeds when all other remedies fail. The galvanic current is generally the most effective, though sometimes the faradic current acts the best.. The positive pole should be applied over the painful part, and the negative pole near by, or on the nerve center from which the affected nerve originates. Sometimes the pain is temporarily aggravated by electricity, but more often it is relieved during the application. It frequently returns, however, so that repeated applications are necessary. The current should be applied from twenty to thirty minutes daily. We have succeeded in curing several obstinate cases of neuralgia by hot and cold applications, when other means have been ineffectual. Quite prompt relief follows freezing the skin over the affected part.

HEMICRANIA—MIGRAINE.

SYMPTOMS.—Attack usually begins in the morning, with heavy, uneasy sensations; slight chilliness; disposition to gape; headache, confined to one side, which rapidly increases, becoming exceedingly severe; eyes sensitive to light; pulse generally slow; at the height of the attack, nausea, retching; bilious vomiting.

This is a very common affection. It occurs more often in women than men, very frequently at the menstrual period.

Causes.—Attacks are generally attributed to taking cold, unusual nervous fatigue, or loss of sleep. We are convinced, however, that in many cases, probably the majority, errors in diet are the real cause of the disease. In scores of instances, we have known the affection to disappear entirely upon the discontinuance of the use of tea, coffee, and of the tobacco habit. We have had an opportunity for observing a great number of cases of nervous headache, or migraine, and have become thoroughly convinced that one of two morbid conditions may be found present in all cases of this disease. These are: 1. Dilatation of the stomach; 2. Prolapse of the stomach and other abdominal organs. The two conditions are frequently found associated. Dilatation of the stomach results in too long retention of food. Bouchard has shown that when food is retained in the stomach for more than five hours, decomposition takes place, and the result is the formation of poisons which, when absorbed into the system, irritate and intoxicate the whole body, just as though alcohol, strychnia, opium, or any other drug had been absorbed. In prolapse of the stomach, bowels, kidneys, and other organs, there is a strain upon the abdominal sympathetic nerves whereby these structures become highly irritated, giving rise to reflex pain in various parts of the body, and a variety of other symptoms. Migraine may be the result of irritation of the sympathetic nerve arising from either cause. Examination of the stomach fluid in a large number of these cases has shown us that fermentation, or decomposition of the food, exists in a great majority of cases, and that, in addition to this, poisonous substances are formed, and enter the blood as the result of indigestion.

Treatment.—For temporary relief, the best measures are fomentations to the affected side of the head, and copious warm drinks until the stomach is relieved. Warm full or sitz baths will often cut short the attack. In case the vomiting is persistent, small sips of hot drink, or of iced water, or small bits of ice, may be taken with benefit. Fomentations over the stomach, or applied to the spine just back of the stomach, are also useful measures.

Exercise in the open air, tonic baths, general applications of electricity, massage in feeble patients, sun-baths, and all other remedies which improve the general health should be employed.

An aseptic dietary (see Appendix) is absolutely indispensable in these cases. Lavage must be daily employed until the tongue, which is habitually coated, becomes clean and the digestion sound. The bowels must be kept regular by proper measures, particularly by the employment of the moist abdominal bandage, the morning cool sponge bath, regularity of habits, and the use of granose and antiseptic tablets (see Appendix). The cold morning sponge bath is an important measure for building up the general health, improving the appetite and digestive vigor. The Natural Abdominal Supporter (see Appendix) is essential in cases in which the abdominal walls are relaxed and the viscera prolapsed.

FACEACHE, OR FACIAL NEURALGIA.

This is one of the most common forms of neuralgia. The pain is usually confined to one side of the face. It may be excited by cold, by decayed teeth, or by causes which are unknown. In some cases the pain is attended by contraction of the muscles of one side of the face, when it is termed tic-douloureux. This form of disease generally occurs in persons considerably advanced in years.

Treatment.—Hot applications to the face, together with hot foot or sitz baths, and the use of electricity, are the most useful measures. The treatment is the same as that recommended for migraine.

LUMBAGO.

SYMPTOMS.—Pain in the back, increased by muscular exercise; patient cannot straighten without great suffering; many tender points found about the seat of pain.

Causes.—The causes of this form of neuralgia are said to be cold, rheumatism, malaria, great exhaustion from overwork. It seems to be, in some cases, the result of severe straining and lifting. Lumbago is in many cases due to prolapse of the abdominal viscera.

Treatment.—Rest, fomentations, or hot and cold applications to the back, and the employment of hot baths will generally secure quite speedy relief. We have afforded complete relief in some cases by the application of the Natural Abdominal Supporter, thus relieving the sympathetic nerve from strain. Other measures recommended for sciatica are useful in lumbago. Continuous stretching of the body succeeds in some cases.

INTERCOSTAL NEURALGIA.

SYMPTOMS.—Pain in the chest, either upon one or both sides; in females most often felt under the breast; pain usually continuous; respiration painful, laughing, coughing, sneezing, exceedingly so.

This disease is often mistaken for pleurisy and other diseases of the lungs. When it affects the left side also, it is often thought to indicate heart disease. Upon careful examination of the patient, however, it will be found that the pain is confined to the spaces between the ribs, and is most severe near the sternum, beneath the axilla, and at the spine. These points are also found to be tender upon pressure, which shows that the disease is confined to the nerve trunk. In many cases of intercostal neuralgia, the pain extends down the inner side of the arm, affecting two fingers upon the inner side of the hand. The pain is sometimes so very severe as to render the patient almost helpless.

Causes.—This form of neuralgia is much the most common in women, in whom it is most generally associated with neurasthenia or nervous debility, dyspepsia, or disease of the reproductive organs. It is often attributed to taking cold.

Treatment.—The affection is best relieved by fomentations or hot and cold applications to the spine, opposite the affected parts. The strong galvanic current, applied to the sensitive nerves, is also of great service. The positive pole should be placed upon the spine, and the negative passed along the course of the affected nerves, or placed successively for a few seconds at each of the sensitive points. Attention must also be given to the improvement of the patient's general health, by proper diet and general tonic measures. See "Spinal Irritation," page 1092.

SCIATICA.

SYMPTOMS.—Begins as a dull, heavy ache in the back and upper portion of the thigh; pain gradually becomes more intense, and is increased by motion of the affected limb; sometimes accompanied by cramps in the muscles of the limb.

This is, perhaps, the most common of all forms of neuralgia. A patient who has had one attack is much more liable to subsequent ones. The disease sometimes passes away in a few days, but generally lasts from four to twelve weeks, and may become chronic.

Causes.—The causes of sciatica are essentially the same as those which produce other neuralgias. It is sometimes produced by sitting on a hard chair a long time. Severe exertion with the limbs also some-

times excites an attack. Cases are mentioned in which it has been occasioned by an enlarged prostate gland ; a predisposition to the disease is produced by a weak or depressed state of the system. We have met many cases in which prolapse of the abdominal viscera, and irritation of the abdominal sympathetic nerve were the cause of sciatica.

Treatment.—In addition to hot baths, hot packs, hot fomentations, hot and cold applications, and the use of electricity, all of which remedies have been fully described in the description of treatment of neuralgia, obstinate cases sometimes require still other measures. We have, in some instances, obtained relief by applications of the ice, ice-bags, or cold compresses. In other cases, we have succeeded by the injection of cold water by means of the hypodermic syringe, the injection being made at the seat of pain, as near as possible to the affected nerve. Pricking the nerve with a needle in some cases gives magical relief. Nerve stretching was formerly practiced by cutting down to the nerve, seizing it by means of the fingers slipped under it, then pulling upon it with sufficient force to lift the limb. This practice naturally resulted, in many cases, in complete paralysis of the nerve. An improved method is stretching of the nerve by raising the straightened leg upward and bending it forward over the body while the patient lies upon his back. An anesthetic is necessary, hence a physician must be employed for the application of this measure. We have effected a cure in some cases by the application of the Natural Abdominal Supporter. Complete and prolonged rest in bed is, in many cases, all that is required to effect a cure.

CRURAL NEURALGIA.

In this affection, the large nerve on the anterior and inner side of the limb is affected. The symptoms of the disease, with the exception of the location of the pain, are the same as those of sciatica. Causes and treatment are also essentially the same.

HEADACHE.

Headache, as a symptom of disease, is present in a great variety of conditions. It is nearly always present in acute fevers. It is also present in most organic diseases of the brain and spine, as well as in many affections of other internal organs, as of the heart, stomach, kidneys, liver, and reproductive organs. When present in connection with

other diseases, it is sometimes the result of disturbance of the circulation incident to those affections, or it may be due to nervous sympathy. The following varieties of headache may be mentioned:—

Congestive Headache.—In this form of headache the head is hot; face flushed; arteries of the neck throbbing; eyes red; and patient complains of a bursting feeling, as though the brain were too large for the skull; the hands and feet are generally cold.

Treatment.—This headache is best relieved by derivative measures applied to the extremities and the application of cold to the head and neck. When it is persistent, it may be necessary for the patient to wear the wet head-cap for several days. If complicated with neuralgia, fomentations should be applied for fifteen to twenty minutes at a time, three or four times a day, the head being kept cool by cold compresses during the intervals. Among the most frequent causes of congestive headache are errors in diet, tight lacing, defective clothing of the feet and the limbs, taking cold, and especially the use of tea, coffee, and alcoholic liquors. All these causes must be scrupulously avoided. The patient should restrict himself to a careful diet, using very little flesh-meat, and avoiding condiments altogether. But few kinds should be taken at a meal, and the patient should eat sparingly. A short course of eliminative treatment, consisting of packs and warm baths, should be resorted to when the patient is quite fleshy and plethoric. When there is great coldness to the lower extremities, the hot foot-bath, alternate hot and cold rubbing, and the leg pack are excellent measures for restoring the balance of the circulation. Persons who are subject to congestive headaches should sleep with the head elevated, so as to check, in some degree, the tendency of blood to the head.

Anemic Headache.— In this kind of headache, the condition of the brain is just the opposite of that in the variety just described. The organ contains two little blood instead of too much. It occurs most often in aged or feeble persons, and persons suffering with nervous debility, anemia, and other diseases characterized by poverty of the blood. This form of headache may be recognized by the fact that the patient often feels dizzy when sitting up or standing, and is relieved by lying down. It generally affects the top of the head, may also be located at the back part or in the forehead. It is not of a throbbing character. May often be described by the patient as a gnawing pain. The pupils are usually dilated, and the tendency to faintness upon assuming an upright position is marked.

Treatment.— The patient should lie quietly in bed, with the head depressed a little below the level of the feet, at least not bolstered up by pillows. Apply alternate heat and cold to the back of the neck and between the shoulders, and continuous warmth to the top and front part of the head, by means of fomentations or the hot water bag. Electricity is a very useful measure in this form of headache. The galvanic current may be employed, placing the negative pole upon the forehead and the positive at the back part of the head; or the faradic current may be used. The sinusoidal current is preferable. Massage of the head is still more effective.

Sympathetic Headache.—This form of headache may arise from disturbance of the stomach, liver, or from irritation of the uterus or ovaries. Headache arising from disturbance of the stomach or liver is generally felt in the front part of the head just above the eyes. The temples are also sometimes affected. Headache from uterine or ovarian irritation is chiefly felt at the top of the head.

Treatment.—This form of headache can be permanently relieved only by the cure of the disorders upon which it depends. Temporary relief will generally be obtained by the application of a fomentation over the part with which the headache is sympathetic, as over the region of the stomach, in stomach headache, and over the lower part of the bowels in uterine and ovarian headache. In some of the latter cases, a hot fomentation over the spine, followed by a rubbing with the hand dipped in cold water, is an excellent means of affording relief. Wearing the wet abdominal bandage at night, and, in severe cases, both night and day, for a time, will often relieve a persistent headache due to derangements of the stomach and bowels. The wet compress, worn over the lower part of the spine, is very frequently effective for the relief of headaches which depend upon irritation of the uterus or ovaries. A hot vaginal douche, used daily, and frequent sitz baths, are also excellent measures in the latter cases.

Sick, or Bilious Headache.—This form is characterized by a throbbing, splitting pain in the temples. The patient also feels sick at the stomach, and generally vomits a large quantity of undigested food followed by bile, before relief is obtained. It is caused by errors in diet. Persons who suffer from this form of headache, habitually, are subject to bilious dyspepsia, and should follow the directions for treatment prescribed for that disease. Generally relief may be obtained by hot fomentations to the head, followed by tepid compresses, hot fomentations

over the stomach and bowels, and hot drinks. When the bowels are constipated, as they generally are, the patient should take a large warm water enema. When possible to do so, warm sitz and full baths should be taken, as great relief is generally afforded by these means. Patients subject to bilious headache should avoid the use of tea, coffee, fats, and sweets. Avoid coarse vegetables, and all indigestible foods. Eat dry food. Granose and bromose are to be highly recommended.

Nervous Headache.— This form of headache closely resembles the preceding in its symptoms, but is generally confined to one side of the head. It is elsewhere described under the head of "Hemicrania, or Migraine," which see for treatment, etc., page 1097.

Headache from Other Diseases.—The headaches of fever, and the headaches which are present in connection with various other diseases, as gout, neuralgia, rheumatism, diseases of the heart, kidneys, and organic affections of the brain and spinal cord, are cured only by the relief of the primary diseases of which the headache is symptomatic. When these are curable, the headache will disappear as improvement in the disease takes place. When incurable, as in organic disease, the pain in the head will, of course, be obstinately persistent.

CHOREA—ST. VITUS' DANCE.

SYMPTOMS.—At first, slight twitching of the muscles of the face and limbs on one side; after a time, nearly all the muscles of the body become affected; constant restlessness; articulation indistinct; twitching of the muscles increased by slight movement; sometimes contractions so strong as to throw the patient upon the floor; digestion impaired, bowels constipated.

Causes.—The causes of this disease are not well understood, neither is it known what part of the nervous system is affected in this disease. It is probable, however, that it is chiefly due to defective nutrition of the brain and spinal cord. We have always found the disease associated with impaired digestion and an inactive state of the bowels. We have also observed that the disease is likely to occur in the children of parents who are addicted to the use of tobacco and alcoholic liquors. It more often affects girls than boys, and is most common between the ages of six and fifteen years. Sexual irritation from masturbation is a frequent cause in both sexes.

Treatment.—The disease is rarely, if ever, fatal, though it may continue a long time if proper treatment is not administered. The most important are such hygienic measures as will improve the patient's

general health. The food should be of the most nutritious character. The patient should take little or no meat, but abundance of oatmeal, cracked wheat, graham bread, and other whole-grain preparations. Exercise in the open air should be taken daily. The bowels should be moved daily by enemas, if they do not move spontaneously; but the application of measures recommended for constipation will generally relieve this difficulty without the constant use of enemas, which is to be avoided when possible. Daily massage and sponging of the whole body in tepid water is also important as a measure of treatment. In addition, we usually employ the ice pack, or hot and cold applications to the spine. These applications should be made daily, from ten to twenty minutes at a time. They are frequently followed by almost immediate relief, which is at first temporary, gradually becoming more permanent. Galvanism of the spine and central galvanization are means which should be employed in obstinate cases. We have often used them with excellent effect. Daily gymnastic exercises are very useful. This plan is used in the hospital for children at Paris. Drs. Gray and Tuckwell report in the *London Lancet* the successful treatment of a large number of cases, and assert that "the hygienic plan is alone sufficient to cure chorea and quite as promptly as any drug."

EPILEPSY, OR FALLING SICKNESS.

SYMPTOMS.—Convulsions, or fits, in which the patient falls; violent jerking of the muscles; frothing at the mouth; biting of the tongue; face at first livid, afterward red and swollen; attack generally followed by disposition to sleep for one or two hours.

This disease is so common that it needs but a very brief description. The symptoms described above are those which occur in a severe case. In milder cases, there may be simply a slight loss of consciousness for a few seconds, after which the patient resumes whatever occupation he may have been engaged in at the time of the attack. If walking across the room, he stops suddenly with a startled aspect, or with the eyes rolled upward. If eating at the table, the attack may be signalized by dropping the knife or fork. This form of the disease is known as *petit mal.* The severe form of the disease is just preceded by peculiar sensations which the patient recognizes as premonitory of the attack, which is termed the aura. In some cases the patient utters a peculiar cry at the beginning of the attack, which may consist of a slight jerking of the toe or finger, or in a peculiar sensation at the pit of the stomach. The epilepsy is a very chronic

disease. In many cases, it is well established before its real nature is recognized, the attacks at first being so slight as to pass unobserved. In many cases, especially in children, they occur in the night, so that neither the patient nor his friends, for a long time, are aware of the existence of the disease.

Causes.—This affection originates from quite a variety of causes, among the chief of which are hereditary influences, sexual excesses, the use of alcoholic liquors and tobacco, syphilis, excessive mental labor, and errors in diet. We have met a number of cases in young men in which the disease was clearly traceable to self-abuse. In several cases of adults which we have treated, other sexual excesses have been practiced, of which the disease was clearly the result. In our opinion, errors of diet have much more to do with producing this disease than is generally supposed. We have rarely met with a case in which there was not marked disturbance of the digestion, and have noticed particularly that the worst attacks, in patients suffering with the disease, almost always follow some error in eating. The use of animal food is highly detrimental. Epilepsy in children has been traced to its use. In some cases epilepsy has been found to be due to tumors or other diseased processes in the brain.

Treatment.—This is an exceedingly obstinate disease, and has long been looked upon as almost incurable. Undoubtedly there are many cases in which the disease is incurable in character on account of the incurable nature of the conditions by which it is produced. When a marked tendency to the disease is inherited, and when it arises from the formation of tumors in the brain, or of other organic changes in the nerve centers, no remedies which can be employed will be found of any special utility. Our experience in the treatment of this affection convinces us, however, that in a large proportion of cases a cure can be effected. In order to accomplish this, the patient must comply rigidly with every needful requirement. The diet must be plain and simple, consisting almost wholly of fruits, grains, and vegetables. Milk and eggs can be used in moderation, but the less meat the patient takes, the better. Those who have had the most experience in the treatment of epilepsy, insist that a vegetable diet is one of the essential features of successful treatment. Bad habits of every sort, and the use of tobacco, alcoholic liquors, and of tea and coffee, must be wholly abandoned. The patient must practice rigid continence. Every possible attention should be given to building up the general health by exercise in

the open air, and regular and adequate sleep, and attention to all the laws of hygiene. It is not only necessary that the patient should eat the right kind of food, but he should be particularly careful to avoid excess in eating. One of the peculiar features of this disease is a voracious appetite with a tendency to eat very rapidly. If the appetite cannot be controlled in any other way, the patient should be placed on an allowance. We have in some instances found the difficulty in controlling the patient's appetite one of the greatest obstacles to recovery. The most effectual remedial measures are general baths, taken with sufficient frequency to secure thorough cleanliness and activity of the skin. In addition, fomentations over the stomach and liver may be taken daily in connection with the warm leg bath, alternate hot and cold applications to the spine, particularly the upper part, and the application of galvanism in the form known as central galvanization, together with galvanization of the spine. In some cases of very inveterate character, we have found it advantageous to employ bromide of potassium for a time, in order to destroy the periodicity of the paroxysms, when they occurred with great frequency. In some cases, in which the bromide of potash has been wholly ineffectual in checking or keeping off the paroxysms, we have been able to accomplish the desired result by means of the other measures described.

During the attack, care should be taken to prevent the patient doing himself injury, as by falling upon some sharp object or upon a hot stove. We had, sometime since, a patient who had broken both ankles, and otherwise injured himself, by falling from the balcony of a hotel during an epileptic fit. Many patients carry with them a wedge of wood, to be placed between the teeth when the symptoms of an attack make their appearance, thus preventing biting the tongue, which is sometimes a very unpleasant feature of the disease. In patients in whom the attack is preceded by an aura, the fit may sometimes be kept off by the prompt application of proper treatment. When the aura is felt in a limb, as is very often the case, simple pressure of the limb against some hard substance, or placing the hand in cold water will in many cases prove effectual. In a case of epilepsy operated upon by the author some years since, the opening in the skull revealed an astonishing thickening of the membrane covering the brain, and extensive inflammation about it. The removal of the diseased structures resulted in great improvement in the patient's condition.

HYSTERIA.

***SYMPTOMS.**—Patient laughs or cries immoderately without cause; has hallucinations; all the senses perverted; morbidly sensitive to light and sound; breast sensitive; pain in ovary; headache; wandering pains in the chest, abdomen, joints, and spine, especially between the shoulders; loss of sensation in the skin; paralysis of certain muscles; sometimes loss of voice; sensation as of a ball rising in the throat; contraction of the muscles; violent spasms; disorder of digestion with symptoms of nervous dyspepsia; changeable temper; sometimes large quantity of pale urine; in some cases delirium or stupor.*

The above is a very inadequate description of this peculiar disease; in fact, a complete description would include a list of the symptoms of nearly all diseases, since there is almost no malady which may not be imitated by hysteria. The affection is not, as many people suppose, wholly an imaginary disease, but is really a malady of considerable gravity. A healthy person never suffers with hysteria. There is always some disease of the nerve centers, although it is not possible to say exactly what is the real nature of the disease. Many authors think that when it occurs in females, as it almost always does, the affection has a close relation with the ovaries. The peculiar phenomena exhibited by the "Jumpers" or "Jumping Frenchmen" of the lumbering regions of Maine, is probably due to a species of hysteria.

Causes.—Hysteria almost always occurs in women, and most frequently between the ages of fifteen and twenty-five. In rare instances it affects men as well as women. We have met a few cases of this kind. The most common causes are sexual excesses, novel-reading, perverted habits of thought, and idleness. It occurs most frequently among young ladies who have been reared in luxury and who have never learned self-control, but who have had every whim and fancy gratified until self-gratification has come to be their greatest aim in life. It is a notable fact that hysteria rarely or never occurs among the women of uncivilized nations. It is stated that before the war, the disease was unknown among the negro women of the South, though it has occasionally been met with since the emancipation.

Treatment.—This disease may be considered as curable in nearly all cases. Indeed it is not, of itself, a fatal malady; but mental and moral, as well as medical, treatment is essential. The patient must be taught self-control; the mind must be, by some means, drawn away from herself. The most effective means of interrupting the paroxysm

is the application of cold in some form to the head and spine. Either the cold pour or the ice pack may be employed with almost certain success. To prevent the recurrence of the paroxysms, the patient's health should be improved as much as possible by abundant exercise in the open air, wholesome diet, plentiful sleep, and general tonic treatment. Sitz baths may be used, in most cases, to advantage, two to six a week, the temperature ranging from 92° to 93° at the beginning of the bath to 88° or 85° at the conclusion. The bath may last fifteen or twenty minutes with advantage. With patients whose blood is pure, massage and inunction three to six times a week should be employed. A daily spinal ice pack, continued from ten to twenty minutes, may be used with advantage. Galvanism to the spine is another useful measure. For paralysis, apply electricity. Rest in bed is essential in some cases.

CATALEPSY.

SYMPTOMS.—Sudden loss of consciousness; patient remains motionless in the same position as when attacked; slight rigidity of the muscles.

This affection is similar to trance. It occurs most often in hysterical women, sometimes in men. The length of the attack may vary from a few minutes to several hours, or even days. Ecstasy is a peculiar form of this affection in which the patient does not lose consciousness but experiences a great exaltation of feeling, and is subject to various illusions and hallucinations. History gives us numerous and very interesting examples of this disease, many of which have been made the means of very extensive religious deception.

TETANUS—LOCKJAW.

SYMPTOMS.—Begin suddenly; muscles of the throat and jaw usually affected first; sensation of stiffness and difficulty in swallowing; jaw becomes set, mouth closed, teeth clenched; mouth drawn to one side; in children, mouth partly open and lips puckered; muscles of the back, neck, and abdomen hard and tense; violent spasms every few minutes; sometimes body bent back in the form of an arch, patient resting on head and heels; pulse frequent and feeble; great thirst, but difficulty and great increase of pain on attempting to swallow; frightful suffering.

This disease most frequently occurs in adults, though it is not unknown in children, in whom it generally occurs soon after birth. It is a very fatal disease, death generally occurring within three to fourteen days. When life is prolonged more than two weeks, the prospect of recovery is greatly increased.

Causes.—The most common cause is lacerated or contused wounds, especially wounds in which foreign bodies are left in the tissues, as from splinters, rusty nails, glass, bullets, etc. Wounds of the extremities are much more likely to give rise to tetanus than those of any other part of the body. It is generally believed by physicians that the affection is most often caused by taking cold in a wound, and not by the wound alone. In infants, it always occurs within one to five hours after the fall of the navel string, and probably arises in the same way as from wounds. The disease generally makes its appearance within nine days after the occurrence of the wound; when the interval is longer than this, it is said to be chronic. The disease has been shown by recent researches to be due to a specific germ.

Treatment.—Nearly all known remedies which affect the nervous system have been tried; the majority, however, without any effect, as the disease still continues to be one of the most fatal maladies which the physician has to encounter. The most effective remedy is the continuous application of the ice pack to the spine. Ice bags or rubber bags filled with ice-cold water, frequently changed, should be employed if possible; care should be taken to keep other portions of the body dry. Prof. Niemeyer recommends the use of warm baths. Either the full bath or the hot-air bath may be employed. Probably the most effective is the Russian bath, in which the patient can lie full length while the bath is being administered. Care should be taken to give the patient an ample supply of fresh air at all times. This is especially necessary on account of diminished ability of respiration. When the patient is not able to swallow without great suffering, as is generally the case, nutritive injections should be employed. See page 737.

PARALYSIS AGITANS—SHAKING PALSY.

***SYMPTOMS.**—Trembling in some portions of the body, usually the arm or leg; trembling ceases when asleep; diminished muscular power.*

There are two forms of this affection. The symptoms given above describe the simple form of the malady, which seems to have no fatal tendency, and, in some cases, is curable by the use of proper remedies. In this form of the disease, the trembling does not generally extend very far beyond the part first attacked. In the more serious form of the affection, the trembling gradually extends from the part attacked until the whole body becomes affected; the patient assumes a stooping posture; general paralysis of the whole body supervenes, which finally leads to a fatal termination.

Treatment.—The most effective measures of treatment are hot and cold applications to the spine, galvanization of the spine and muscles, together with the daily use of hot sponging of the affected muscles. The general health should be improved by the use of tonic measures and a nutritious diet. These measures are generally effective, if perseveringly used, in the mild form of the affection, but accomplish nothing more than to retard the progress of the severer form, which is always fatal.

MUSCULAR ATROPHY—WASTING PALSY.

SYMPTOMS.—Begins with loss of strength in arms and legs; pain in the affected muscles; slight quivering of the muscles; most often commences in the upper extremities; generally begins with wasting of the muscles of the hand, the wasting extending to the arm and shoulder, and then to the whole body.

As pain is one of the first symptoms felt, the disease is often taken for rheumatism or neuralgia, its real character not being discovered till marked wasting has occurred.

Cause.—Overuse of the muscles is probably the principal cause of this affection. It occurs most frequently in professional dancers, blacksmiths, athletes, and others who habitually practice great exercise of certain muscles.

Treatment.—Galvanization and faradization of the affected muscles, hot and cold rubbing, hot sponging and massage applied to the affected parts. Galvanism and hot and cold applications to the spine are serviceable in some cases. Drugs are of no value.

NEURITIS—INFLAMMATION OF A NERVE.

SYMPTOMS.—Neuralgic pain in the affected nerve, with loss of sensation in the parts to which it is distributed; pain continuous; nerve tender; pressure upon nerve causes pain in the parts in which the nerve ends; twitching of the muscles in the affected part; generally no fever.

It is sometimes difficult to distinguish neuritis from neuralgia, since the pain of neuralgia is not infrequently caused by inflammation of the affected nerve. Recovery from neuritis is very often incomplete, the patient continuing to suffer pain in the nerve, and numbness in the parts supplied by it. Inflammation of the sciatic nerve is a common cause of obstinate sciatica, in consequence of the sheath of the nerve becoming thickened.

Cause.—The most common cause of neuritis is injury of the nerve,

or an inflammation of the adjacent parts. The inflammation is sometimes rheumatic in character.

Treatment.—Rest; ice along the course of the nerve; in case the ulnar nerve of the arm is affected, the whole arm may be enveloped in ice-cold compresses. It is also well to keep it elevated, so as to induce contraction of the blood-vessels. Hypodermic injections of ice-cold water into, or near, the nerve, and the use of a strong galvanic current, applied for half an hour once a day,is effective in severe cases. Galvanism, faradization, hot sponging, fomentations, and alternate hot and cold applications, are the best remedies for the effects which may remain after the subsidence of acute inflammation.

FACIAL PARALYSIS.

SYMPTOMS.—Patient cannot close the eye on the paralyzed side; cannot wink; tears run over the lower lid upon the cheek; face drawn to one side, most evident when patient smiles.

This affection involves paralysis of the seventh cranial nerve, which is the nerve of motion of nearly all the muscles of the face. It produces a very unpleasant deformity. The side of the face affected is without expression, remaining motionless when the patient laughs or smiles. If he attempts to whistle, the mouth is puckered to one side. In eating, the food accumulates between the teeth and the cheek on the affected side, making it necessary for the patient to use his finger to dislodge it.

Causes.—Cold; inflammation of the facial nerve; disease of the heart; injury to the temporal portion of the skull.

Treatment.—Galvanic electricity applied to the affected parts daily or every other day. Faradic electricity is sufficient in mild cases; electricity in some form is essential. Care should be used not to employ too strong a current when using galvanism about the eye. Pinching and manipulation of the affected muscles is an excellent means of restoring their function. On account of the eye remaining open, it is subject to many sources of irritation, as dust, cold winds, etc. The patient may remedy this difficulty to a considerable extent by closing the eye with the finger, or holding the lids together by means of a strip of adhesive plaster. An eminent New York surgeon, Dr. Detmold, has invented an ingenious means of relieving the deformity to a considerable degree. It consists of a smooth hook, made of gutta-percha or silver wire, which is hooked into the corner of the mouth on

the affected side and connected by an elastic band to the ear. This simple instrument draws the muscles of the mouth into proper shape, and not only relieves the deformity, but when used continuously for a long time, does much toward effecting a cure. An ingenious surgeon has suggested the use of a double hook, made of zinc and copper wire bound together by copper wire, one end being attached to the ear and the other to the corner of the mouth. The electric current generated helps the cure.

TEMPORARY PARALYSIS.

A slight temporary paralysis is sometimes produced by pressure upon a nerve trunk. Temporary paralysis of the arm is often produced by lying upon it during sleep, or falling asleep with it hanging over the back of a chair in such a way as to allow it to press upon the nerve. When the paralysis is slight, the arm is said to be "asleep." It may also be produced by a blow upon an exposed nerve, as by a sudden blow upon the elbow at the point popularly termed the "crazy bone," or "funny bone." "Crutch paralysis" results from the pressure of a crutch in its use in walking.

Treatment.—Rest, rubbing, hot and cold applications, and the use of electricity, are all the measures usually required to effect a speedy cure.

MIMETIC SPASM OF THE FACE.

SYMPTOMS.—Grimaces, usually of one side of the face only, such as wrinkling the forehead, blinking the eyes, twitching of the nostrils, drawing down the corners of the mouth ; spasm is excited by motions of the body, even by walking ; contractions ; sighing during sleep.

This is a very curious disease, giving to the patient, in many instances, a very comical appearance. In some cases it attacks the little muscles of the external ear, which are not ordinarily under the control of the will, sometimes keeping the ear in constant motion for hours at a time. Contractions are not usually accompanied by pain. The spasm is, in some cases, continuous, the features of one side of the face remaining drawn for a long time; in others, a quick jerking movement occurs at short intervals. When continuous, the spasm of the muscles is termed "tonic;" the interrupted spasms are termed "chlonic."

Causes.—The most common are cold, injuries to the face, decayed teeth, and abnormal mental emotions.

Treatment.—Warm baths, massage, galvanism to the part, and attention to the patient's general health, are the most effective measures. The disease is obstinate, and frequently does not yield readily to treatment. In severe cases, pressure over the principal branches of the facial nerve should be applied. The pressure is most effective just in front of the lower portion of the ear. It may be made continuous by means of a spring attached to a hard pad. Division of the affected muscles has been tried in some cases.

TORTICOLLIS—WRY NECK.

SYMPTOMS.—Ear of one side drawn toward collar-bone, twisting the head; spasm interrupted or continuous; when both sides are affected, spasmodic nodding, or head bent forward.

This peculiar affection is very often combined with spasm of the face. Its causes are quite obscure, though in many cases the disease is traced to exposure to cold. It may arise from disease of the vertebræ.

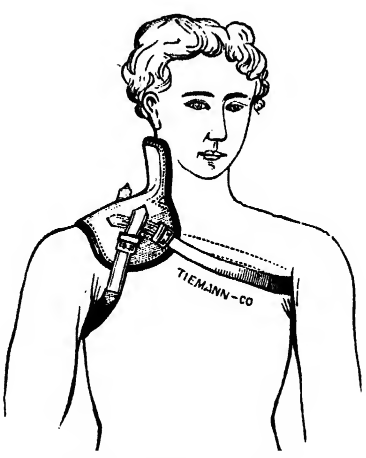


Fig. 321. Splint for Wry Neck.

Treatment.—Wry neck sometimes resists the most energetic treatment. The majority of cases, however, can be relieved, and in time cured. Experience shows the best remedies to be the application of electricity, massage of the neck, hot and cold to the upper spine, rest, and warm baths. Incurable cases may be relieved by an apparatus (Fig. 321).

WRITER'S CRAMP.

SYMPTOMS.—At first, fatigue and sense of insecurity in arm and hand; patient grasps his pen too firmly; fingers seem clumsy; pen jerked up and down by twitching of the muscles of the hand and arm.

Under the head of writer's cramp may be included a number of allied diseases affecting other muscles than those of the hand; thus we have cobbler's cramp, milker's cramp, and blacksmith's cramp, as well as writer's cramp.

Cause.—The principal cause which has been assigned for this affec-

tion, is the long-continued use of a single set of muscles in a particular way, as in writing, milking, and in other occupations. The most recent explanation of the nature of the disease is, that it is chiefly due to an increase of the power of automatic movement in the affected parts. It is well known that when certain movements are many times repeated, they may after a time become automatic, that is, are performed without the direct action of the will. It has been suggested that writer's cramp is an exhibition of this faculty in an exaggerated degree, due to a long-continued use of one set of muscles in the same way. It is said that copyists are much more likely to be affected with the disease than editors, authors, and others who compose as they write. This explanation does not seem to us very satisfactory, however, since walking, an act which becomes almost completely automatic, is not affected by any disturbance of this sort. The observation mentioned with reference to the class of persons affected, may be readily explained by the fact that with the copyist the motions of the hand are more uniform and continuous. Authors write as they think, sometimes fast, sometimes slowly, and often with frequent pauses, which affords opportunity for the muscles to rest. It has been noticed that this affection has arisen since the introduction of steel pens, and hence it is attributed in some degree to their use. It is also thought that the disease is encouraged by anything which restricts the motions of the muscles of the arm, as a tight coat-sleeve, an elastic, or any other means of constriction.

Fig. 322. Apparatus for Relief of Writer's Cramp.

Treatment.—In many cases absolute rest of the affected muscles is necessary. This frequently necessitates a change of occupation. Every possible attention should be given to improvement of the general health. The application of galvanism to the affected muscles is an effective remedy in many cases. Hot sponging, alternate hot and cold applications, and massage, are also of use. Some patients obtain the needed relief of the affected part by learning to write with the other hand; but, unfortunately, in many cases, this also becomes affected. Some relief from the disagreeable jerking may be obtained by the use of quill or stub pens.

Still more benefit may be derived by the use of a simple apparatus shown in Fig. 322, which consists in a rounded part, to be held in the hand, to which is attached an adjustable pen-holder and pen. By means of a screw, the pen-holder may be placed at any angle necessary. The fore and middle fingers are supported by rests at the sides of the instrument, while the thumb lightly grasps the rounded portion in the palm. This enables a person to write without putting the hand in the usual position, in which the pen is grasped by the thumb and forefinger. Fastening a sponge to the pen-holder at the point at which it is held, sometimes answers the same purpose. Some persons find great relief by grasping the pen between the first and second fingers. The most valuable remedy is massage. (See "Art of Massage," Mod. Med. Pub. Co., Battle Creek, Mich.)

CRAMP.

This term is applied to a sudden spasmodic contraction of a single muscle or set of muscles. It most frequently occurs in the calf of the leg. It sometimes extends to the whole body. It is often very painful. In many cases the spasm is preceded by a crawling or tingling sensation, or stiffening of the parts affected.

Treatment.—When the cramp is confined to a single muscle, as in cramp of the leg, it may be relieved by simply grasping the muscle and pressing it with considerable force.

A gentleman who was much troubled with this peculiar affection, and to whom we recommended compression as a remedy, had made for the purpose, two straps, furnished with a buckle at each end, which he always carried with him. Whenever he felt the first symptoms of attack, he would apply the straps to the calves of the legs, where the cramp always began, buckling them as tightly as possible. The application of heat and cold to the spine, with fomentations to the affected part, are useful measures. When the cramps extend to various parts of the body, a general warm bath will usually afford relief. Some cases are best relieved by applications of ice to the spine. Ice may be applied by the ice pack, or by rubbing a piece of ice, inclosed in a piece of muslin, up and down the spine. The patient should be kept as quiet as possible, as the least motion will often induce a return of the spasms after they have ceased. Gentle manipulation of the affected muscles, if very cautiously performed, will sometimes relieve the tendency to spasm.

SLEEPLESSNESS, OR INSOMNIA.

This is a serious symptom of disease of the nervous system which should not be neglected. When an individual cannot sleep, his nervous system will rapidly get out of repair, and serious disorders will make their appearance in consequence of nervous debility induced by want of rest. Sleeplessness is often a precursor of insanity, of which it is not infrequently an important symptom. In many cases, the mental disease is due to loss of sleep for a protracted period. When an individual discovers that he is becoming habitually sleepless, perhaps lying awake several hours every night, not obtaining more than one-half the proper amount of sleep, he should at once give serious attention to the matter, for the purpose of remedying the cause.

Causes.—The patient may be deprived of sleep in consequence of pain in some part of the body, as from neuralgia, from severe headache, or from other painful affections, or he may toss about, anxiously longing for sleep, but kept awake by mere nervousness. In other cases the immediate cause of inability to sleep is activity of the intellect, the mind continuing so active that sleep is impossible.

The principal causes of sleeplessness are eating before retiring, excessive brain work, too little physical exercise, indigestion, the use of tea and coffee, tobacco-using, the use of alcoholic liquors, and high living, especially the excessive use of meat and stimulating condiments. Constipation, biliousness, heart disease, asthma, and other affections which produce congestion of the brain and an irritable condition of the nervous system, are frequent causes of deficient sleep.

Treatment.—A person who suffers from sleeplessness should avoid the use of tea and coffee, tobacco, alcoholic liquors, and all other stimulants and narcotics, but should especially avoid eating late at night. Eating just before retiring has been recommended for sleeplessness, and, in some cases, a palliative effect is certainly produced, but the ultimate result is an aggravation of the difficulty instead of relief. If a person suffers "faintness" or "all gone feelings" at night, so that he cannot go to sleep, he should take a few sips of cold water or a glass of lemonade. As complete relief will generally be obtained as from eating, and the stomach will be saved the unpleasant task of attempting to digest a meal when it should be resting with the remainder of the body. A warm bath just before retiring, a wet-hand rub, a cool sponge bath, gentle rubbing of the whole surface of the body with the

dry hand, massage, galvanism applied to the head and spine, hot and cold applications to the spine, and fomentations over the stomach, followed by the moist abdominal bandage, are useful measures. When the feet are cold, they should be thoroughly warmed by a hot foot or leg bath, and thorough rubbing. In many cases, the alternate hot and cold foot bath or the shallow cold foot bath are more effective than the hot foot bath. When the head is congested, these measures should be supplemented by the application of cold to the head, as the cold compress, the ice-cap, or a cold pour. In some cases a tight bandage about the head and a cold compress laid over the eyes, after the patient goes to bed, is effective. Persons suffering with hyperemia or congestion of the brain, should raise the head of the bed a few inches, so as to diminish the tendency of the blood to the brain.

Persons who suffer for want of sleep from sedentary habits are benefited by a walk in the evening, just before retiring, or gentle calisthenics. In most cases it is important that the patient should retire early. This is especially the case with persons whose sleeplessness is connected with neurasthenia or nervous debility. Unfortunately, in many of these cases, the patient feels better in the evening than in any other part of the day, and consequently is very reluctant to go to bed, especially when he has the unpleasant prospect before him of tossing uneasily about till day-break. The disposition to put off retiring until a late hour should not be yielded to, as the unusual exhilaration felt in the evening is an unnatural condition, which, if encouraged, will aggravate the difficulty. All exciting influences should be avoided in the evening. The patient should keep himself as quiet as possible. In many cases it is necessary to forbid conversation or reading, or even amusement of any sort which will excite the nerves or mental faculties. Hot-water bags, hot jugs, and bed-warmers of all descriptions are of use for individuals whose circulation is unusually defective, though, in some cases, these means of relief may become a source of damage when depended upon too largely and for a great length of time. Attention should be given to the bed and the sleeping apartment. Feathers should be discarded. The bed should be neither too soft nor too hard, and should be thoroughly aired daily. An abundant supply of fresh air should be introduced into the bedroom in such a way as to secure its admission without drafts. As a general rule, a fire in a sleeping room, at the time of retiring, is not advantageous. Care should be taken that the bed be thoroughly

warmed and the apartment dried during the day, but the room should be at least ten degrees cooler at night than is required for comfort during the day.

Various devices have been proposed for the benefit of persons who lie awake at night for hours, unable to get to sleep on account of excessive mental activity, such as counting, repeating over some simple formula of words, etc. The best means of this kind we have ever become acquainted with, is the practice of prolonged deep inspirations. The lungs should be slowly filled to their utmost capacity, and then emptied with equal slowness, repeating the respiration about ten times per minute, instead of eighteen or twenty times, the natural rate. In the majority of cases in which sleeplessness is not due to any special exciting cause, this plan is quite effective. We have often recommended it with entire success. Simply stroking the head will often soothe the nerves of a patient till he readily falls asleep. This is not due, however, to any mesmeric or magnetic influence on the part of the rubber.

When a person falls asleep upon first going to bed, and after sleeping two or three hours, awakes, and is unable to get to sleep again, relief will in many cases be obtained by getting out of bed, and rubbing the whole surface of the body with the dry hand. Simply walking about the room for a few minutes, exposing the skin to the air, will have a quieting effect upon the nerves, so that when the person returns to bed he will quickly fall asleep. It is especially important with most persons who do not sleep well, that rest should be undisturbed after the patient falls asleep at night. Great care should be taken to avoid waking such a person, as if not roused he may sleep quietly until morning, when, if wakened, he will lose the whole night's rest.

The use of drugs for the purpose of inducing sleep should be avoided as much as possible. Opium is especially harmful, and its use should not be resorted to when it can be, by any possible means, dispensed with. Sleep obtained by the use of opiates, is by no means a substitute for natural sleep. The condition is one of insensibility, but not of natural refreshing recuperation. Three or four hours of natural sleep will be more than equivalent to double that amount of sleep obtained by the use of narcotics. When a person once becomes dependent upon drugs of any kind for producing sleep, it is almost impossible for him to dispense with them. It is often dangerous to resort to

their temporary use, on account of the great tendency to the formation of the habit of continuous use. The use of opiates for securing sleep is one of the most prolific means by which the great army of opium-eaters is annually recruited. Chloral, bromide of potash, whisky, and other drugs are to be condemned almost as strongly as opium. If any sleep-producing agent besides the simple remedies mentioned must be employed, it should be under the directions of a physician. Some simple sleep-producing drug may be used for a few days, but any drug which is powerful enough to serve as a satisfactory drug substitute for opium is equally as dangerous, since its use may easily develop another poison habit.

SOMNAMBULISM.

Sleep-walking must be regarded as a nervous disorder, or at least symptomatic of a disordered condition of the nervous system. It most often occurs in persons of a hysterical temperament, being very common in persons suffering from hysteria. In this class of persons it may be induced by anything which occasions disordered sleep. It always occurs in connection with dreams, which are sometimes of such a vivid character as to occasion violent exertion on the part of the patient. For further explanation of sleep-walking, see page 146.

Treatment.—When the person is found to be addicted to sleep-walking, careful inquiry should be made respecting the condition of his health, particularly that of the nervous system, and treatment should be applied accordingly. All causes likely to excite the nervous system should be removed. Give the warm bath at night and a cool sponge on rising. The patient should be watched. When this is impossible the door of the sleeping appartment should be locked, and the window so arranged as to prevent egress. It has been recently suggested that sleep-walking may be cured by placing by the side of the sleep-walker's bed a strip of sheet-iron, tin, zinc, or other metal of such length and width that when he puts his feet out of the bed they will rest upon the metal. It is claimed that the sensation produced by contact with the cold metal will awaken the person. A strip of wet carpet has been successfully used in the same way. We have known several instances in which somnambulists have narrowly escaped death from falling from a high window, being caught and restrained just in time to prevent the catastrophe.

HOMESICKNESS, OR NOSTALGIA.

Although homesickness is generally regarded as a mere notion on the part of the patient, it is, in reality, in many cases, a disease, and should be treated as such. Cases have occurred, in which, through the depressing influences of nostalgia, the most disastrous results have occurred. Patients generally lose appetite, become sleepless, greatly debilitated, and sometimes sink into a state of melancholia.

Treatment.—The proper treatment of homesickness includes mental and moral, as well as medical, measures. The patient should not be lectured and scolded for his strong desire to return home, although he should be encouraged to exercise as much self-control and restraint over his feelings as possible. Pains should be taken to divert his attention from the cause of his depression by means of amusement, diversion of mind, variety of diet, and surrounding him with as many favorable conditions as possible. In the majority of cases, the difficulty will disappear after a few weeks, though it may persist for some time.

HYPOCHONDRIA.

This disease derived its name from the supposition that it was dependent upon disease of the liver. The malady assumes a great variety of forms. The patient is generally moody and desponding, the degree of sadness sometimes being so great that nothing will provoke a smile. The patient imagines himself to be the victim of almost any number of incurable diseases. If the mind is relieved of one cause of apprehension, some other equally groundless one will be quickly discovered. Hypochondriacal patients seldom sleep well. They exhibit in their minds great want of resolution and lack of mental force and vigor. Their circulation is generally poor, hands and feet being nearly always cold. The digestion is disturbed in nearly all cases.

Causes.—A very frequent cause of hypochondria is sexual excesses in youth, the consequences of which, though bad enough, are sometimes immensely exaggerated. An inactive condition of the liver, derangement of the digestion, nervous debility, and various other functional disturbances of the body, may give rise to hypochondria.

Treatment.—It is important that this affection should receive prompt and thorough attention, as, in many cases it is a precursor of insanity. When taken in its early stages, almost every case is curable by proper measures, which consist in removing all the real causes of the af-

fection, and then endeavoring to convince the patient of the non-existence of the imaginary evils. When the digestion is disturbed, such treatment as has been recommended for the various forms of indigestion should be applied. The same should be done in case the liver is affected. Nervous debility requires the treatment which has been recommended for this condition. Warm baths, and later cold baths, massage, kumyss, rest-cure, applications of the galvanic, static, and sinusoidal electrical currents, carefully graduated gymnastics, and manual Swedish movements are the most essential measures of treatment.

INSANITY.

This is an affection which has given rise to an immense amount of discussion among physicians, philosophers, and moralists, from the earliest ages down to the present. Mental derangement has been universally considered one of the most terrible calamities which could befall an individual. The exact nature of the disease, however, was never thoroughly understood until the darkness which surrounded it was dispelled by the modern investigation of the subject. The old idea of insanity held it to be a disease of the mind or soul. This theory is no longer tenable, however, in the light of modern investigations respecting the nature of the mind and its relation to the brain. As has been elsewhere shown (see page 137), mind is simply the result of the activity of the brain, although it cannot be called a secretion, as it has been termed by some. It is just as much a result of the activity of the cells of the brain, or of certain parts of it, as the bile is a result of the activity of the cells of the liver, or gastric juice of the cells of the peptic glands. So-called mental disease is really disease of the mind-producing organ, or the brain. Thus, properly speaking, insanity is not a disease of the mind, but of the brain itself. This theory is amply sustained by hundreds of post-mortem examinations which have been made at institutions for the insane, where the most thorough and full investigations of this subject have been carried forward. The general principle can now be well sustained that every case of serious mental disease is accompanied by certain definite changes in the substance and cell structure of the brain, and the amount and character of the mental disorder is exactly proportionate to the nature and location of the tissue-changes in the brain.

Insanity has been variously defined by different authors, and the great diversity in the definitions given suggests very strongly the fact

that an absolutely perfect definition, which shall include all cases which properly belong under this head, without including any others, is impossible. A late writer on the subject defines insanity as being "a manifestation of disease of the brain, characterized by a general or partial derangement of one or more faculties of the mind, and in which, while consciousness is not abolished, mental freedom is perverted, weakened, or destroyed." One of the greatest obstacles which is presented in the study of insanity is the difficulty of distinguishing between natural eccentricity and real mental derangement. There is no sharp dividing line between the cases in which mental derangement may be so slight that the individual is simply said in popular phrase to have "a kink in the head" or, as in Scotland, "a bee in the bonnet," and those in which the mental disorder is so pronounced as to render the individual incompetent to perform the ordinary duties of life. In other words, it is often very difficult to say whether an individual is really insane, or whether he is exceedingly odd, or eccentric. Some have even gone so far as to say that entire sanity is much more rare than some degree of insanity. Perhaps this is an extreme view of the matter, but it may safely be said that there are far more insane people engaged in the active duties of life, following their accustomed vocations with greater or less success, than are found within the walls of lunatic asylums.

Certain symptoms which are present in cases of insanity should be defined, in order to render a description of the disease intelligent. The principal are *illusion, hallucination, delusion, incoherence*, and *delirium*.

Illusion is a false, exaggerated, or perverted perception of something which is really appreciated by the senses; for example, the patient, seeing a small object moving across the floor, may think it to be a mouse or a reptile, having an illusion of sight. A person suffering with illusion of the sense of hearing, may pervert the gentle patter of rain into a conversation held between two persons in a neighboring room. The senses of touch, taste, smell, etc., may be subject to illusion. This is not by any means a positive symptom of insanity, as the best of us are subject to illusion at times, and it has been very sagaciously suggested that it is really more than probable that we never appreciate objects exactly as they are, that our senses never inform us with absolute correctness, perhaps, of the objects with which we come in contact. This accounts for the difference in individual judgments in some matters, and in the judgment of the same individual at different times.

Hallucination.—This is a false perception which has no foundation whatever, originating entirely within the brain. The perception is wholly imaginary, and not, as in the case of illusion, a simple perversion of a real perception. A person affected with hallucination sees pictures and images upon a blank wall. He imagines himself surrounded by various persons or objects when he is quite alone. A very curious fact is that persons who may be absolutely deprived of any of the senses may suffer with hallucinations of the lost sense; as, for instance, a woman who had been totally deaf for years, being unable to perceive the loudest noises, not noticing even the firing of a cannon, when suffering with hallucination, was constantly troubled with voices whispering in her ears.

Delusion.—A person may suffer with both hallucinations and illusions and yet be perfectly aware of the imaginary character of his perceptions; but when the mind is so affected that hallucinations and illusions are considered as realities, the individual is subject to delusion. Although delusion is a much more serious mental derangement than either illusion or hallucination, it is by no means a positive test of insanity, as it has often been considered to be, by both legal and medical authors. As a recent writer remarks, if delusion were a test for insanity, " one-half of the world would be trying to put the other half into lunatic asylums."

Incoherence.—An individual is incoherent when he puts words together without proper relation to each other, so that they do not make sense.

Delirium.—Delirium is a condition of the mind in which all the previously mentioned symptoms are present, together with inability to sleep, active pulse, and great restlessness. It is very common in acute fevers.

Mental disease assumes a very great variety of forms, according to the different portions of the brain affected or the different faculties involved. We shall not attempt to go into an elaborate consideration of the subject, however, but will briefly call attention to some of the most common forms of the disease, which are termed *mania*, *melancholia*, *paranoia*, and *dementia*.

Causes.—The causes of insanity include all of the numerous causes to which attention has been called in the first part of this section, as productive of nervous disease. Anything which tends to interfere with the nutrition of the brain may become a cause of insanity.

Among the special causes may be mentioned excessive mental exertion, powerful emotions, unrestrained passions, sexual excesses, disorders of the digestion, the use of opium, alcohol, and tobacco, general disorders of the system, diseases of the kidneys, liver, and other internal organs, organic diseases of the brain, spinal cord, etc. One form of insanity makes its appearance during pregnancy, or after childbirth. It seems to be dependent upon this particular condition. Religion has been charged with producing insanity in persons who have given themselves up to religious exercises in an immoderate degree, but we seriously doubt whether genuine religion is in any case the real cause of mental disease. Religious fanaticism may lead to insanity, if, indeed, it may not be considered one form of mental disease. We have found by careful investigation of a number of cases of so-called religious insanity, that some other cause really lay at the foundation of the disorder, as unrequited affections, disappointment in love, or some other condition in which the emotions were strongly involved; loss of sleep; long standing nervous disease, etc.

In not a few instances, we have found the real cause of so-called religious insanity to be self-abuse; indeed we are thoroughly satisfied that the sexual excesses are responsible for a much larger proportion of mental disease than is generally supposed to be the case. Heredity is also a very common cause. It has long been thoroughly established that a tendency to insanity runs in families. The children of epileptics are likely to be insane. The notable increase of insanity is one of the most alarming features of the time. At the present time there are more than forty thousand lunatics, recognized as such, in the United States, while there is, undoubtedly, a much larger number of individuals who are suffering with a moderate degree of mental disorder, but have thus far been able to escape detection.

Mania.—In this form of mental disease nearly all the mental faculties are generally affected. The patient suffers with illusions, hallucinations, and delusions. The controlling influence of the will over the mental faculties is lost. The patient is subject to impulses of various kinds. The mind may be either morbidly excited and exalted, or morbidly depressed. The disease generally begins with depression and a disposition to be alone, sleeplessness, symptoms of dyspepsia, and other derangements of health. The patient complains of pain and fullness of head, confusion of thought, and the usual symptoms of congestion of the brain. He also manifests irritability

of temper and such peculiarities of behavior as are likely to attract the attention of friends, and arouse a suspicion that something is wrong with him. As the disorder becomes fully developed, mental disturbances make their appearance, and may assume almost any form, from simply harmless delusions or hallucinations to an uncontrollable disposition to commit violence upon himself or upon his attendants. There is generally a marked change in disposition. The patient will frequently hate, with great intensity, persons and things for which he has entertained great fondness. A mother will conceive a desire to kill her child, a husband to take the life of his wife. More often, however, the disposition to violence is turned upon the individual himself, as in suicidal mania. A person suffering with acute mania has a frequent, feeble pulse, and sometimes some fever. Speech is noisy and incoherent; he will often refuse to eat or drink, making it necessary, in many cases, to employ force in order to prevent starvation. Mania may become chronic, though it has a general tendency to recovery. Finally the most active symptoms subside, some settled delusion taking possession of the patient. When recovery takes place, it is generally within a year and a half or two years. The longer the disease continues after two years, the less the likelihood of recovery.

Melancholia.—This is one of the most terrible forms of mental disease. Like mania, it is preceded by premonitory symptoms which are essentially the same as those given for the disease just described. Patients suffer with many of the symptoms of mania, but, as a general rule, there is less activity. The state of depression continues. The patient seldom develops violent symptoms; he is usually passive and easily controlled, but is haunted continually by hallucinations and illusions, often of the most terrible character. Melancholia, when attended by paralysis or imbecility, is an almost hopeless disease. It usually terminates in dementia.

Paranoia.—A form of insanity in which there is no general disorder of mind, but certain delusions or hallucinations, especially delusions of persecution and ambitious hallucinations. The disease is essentially chronic, and incurable.

Dementia.—This is a condition toward which all forms of insanity tend. There is a general loss of intelligence, or failure of all the mental powers. When confirmed, it is an entirely hopeless condition.

Paresis, or General Paralysis of the Insane.—The most marked symptoms of this disease are slight trembling of the hand, especially when extended, and of the tongue, when protruded, and lips, when

speaking. There is a marked change in character and disposition. The patient is subject to extravagant delusions, speech is thick, gait is shuffling and resembles that of a drunken person; in an advanced stage of the disease, convulsions may appear. The disease lasts from a year and a half to four years. It is almost certainly fatal. The principal causes are intemperance and dissipation.

Treatment.—There is probably no disease in the treatment of which so marked improvements have been made in modern times as in the case of insanity. In ancient times, and, indeed, in times very near to the present, the insane have been treated like wild beasts. As soon as evidence of mental disorder was discovered, they were considered at once as doomed, and no efforts made to ameliorate their condition. Many times they were treated with great inhumanity and cruelty. Indeed it has only been within the last century that the treatment of insanity has been made, in any degree, rational; and often, at the present day, there are evident opportunities for further improvement. It is of great importance that the first beginnings of mental disease should be detected; hence every individual should become, to some extent, intelligent on the subject. When a person shows, in a marked degree, any of the symptoms above mentioned, he should be carefully watched. If the individual himself feels strange impulses, and an almost uncontrollable disposition to take his own life or do violence to others, he should at once consult an intelligent physician, or put himself under the watchcare of some one sufficiently intelligent to care for him. There is good reason for believing that no small proportion of the crimes of violence committed are due to temporary or obscure mental disorders.

In the treatment of the insane, attention must be given to every function of the body, as well as to that of the brain, since the disease of the brain often depends upon disease of other organs. Disease of the digestive organs, producing malnutrition of the brain, is one of the most common of all causes of insanity, and we doubt not that many who are now inmates of insane asylums might have been readily cured, had this fact been recognized and the difficulty removed at the outset. We have treated quite a number of cases in which the patient had been confined for a longer or shorter period in an insane asylum, yet by giving attention to improvement of digestion, thus securing better nutrition of the brain and nervous system, have succeeded, in nearly every instance, in restoring the patient to complete mental soundness.

In women, the condition of the reproductive organs should receive particular attention, as local irritation in these organs not infrequently occasions the most serious mental aberration.

The question of confinement in an asylum is one of very serious moment. It is often decided without a careful consideration in all its bearings. When the condition of the patient is such as to make physical restraint necessary, and when this cannot be secured at home, together with intelligent medical supervision, or when the disease is so thoroughly confirmed that the prospect for recovery is exceedingly small, undoubtedly confinement in a well regulated asylum is the best disposal that can be made of the patient; but when the individual has still sufficient intelligence to appreciate his condition, it seems as though confinement in an asylum with large numbers of other individuals suffering with all the grades of mental disease, must be, in a high degree, detrimental to the patient's recovery, especially when the aversion to such confinement is exceedingly strong on the part of the patient. These difficulties exist, of course, in a much less degree in small institutions, where but very few patients, or only cases of a mild character, are received; but by far the most preferable plan is that which has been for many years pursued in Holland, where certain country districts are devoted to the treatment of the insane, patients being placed separately in the families of farmers who are employed to care for them under competent medical directors. Not more than one or two patients are generally received into a family; and they are treated as members of the household, and are thus saved from the possibility of any sort of damaging influence from asylum confinement and restraint, and especially the contact with other individuals in a condition similar to, or worse than, their own.

In acute mania, in which there is marked congestion of the brain, the treatment elsewhere prescribed for congestion, or hyperemia, of the brain should be administered. The patient should be kept as quiet as possible, the diet should be nutritious but unstimulating. If the fever is considerable, the patient should have frequent sponge-baths. If he will not submit to treatment, the cool air-bath can be readily administered with good effect. When it becomes necessary to employ measures for the purpose of controlling the mental excitement, the cold wet-sheet pack is a most excellent measure; but no drug should be administered without the advice of a physician. In addition to all other remedies which may be employed, mental and moral treatment

should not be neglected. Efforts should be made to cultivate the patient's will-power and self-control, and lead him to appreciate his condition and to co-operate with the treatment as far as possible. Thanks to the modern advances in the management of this affection, it is now by no means so hopeless as it was formerly supposed to be; and by perseverance in the proper line of treatment, a large number of recoveries may be hoped for, especially if early attention is given to the disease.

In conclusion, we wish to remark, that from a personal acquaintance with the superintendents of a number of large State asylums for the insane, we are thoroughly convinced that the prejudice which in some parts prevails against these institutions is altogether unfounded. The numerous stories which are circulated respecting the cruelties practiced in the management of patients are generally put in circulation by patients who have been discharged before complete recovery has taken place, and are generally unreliable. Superintendents of insane asylums are, as a rule, humane and kind-hearted men, and do all in their power for the relief of patients under their charge.

IDIOCY AND IMBECILITY.

Idiocy is a condition of mental deficiency existing from birth, the individual being born with a deformed or undeveloped brain, just as persons may be born with deficient development of the limbs or of any other part of the body. The mental deficiency is shown by an unusually small head, which is very much flattened in front, the average circumference of the head being about thirteen inches, or five or six inches less than usual in health. Various other physical deformities are also present, as deficient development of the teeth, protrusion of the upper jaw, giving the child an ape-like appearance. In some cases the resemblance to sheep or monkeys is very great. The degree of mental development in idiots is often much less than that of the higher animals. Their habits are exceedingly filthy, the natural instincts which characterize the lower animals being apparently absent. In some cases, however, a considerable degree of intelligence is manifested in certain directions, such as ability to calculate correctly, a fondness for and appreciation of music, etc.

Cretinism is a form of mental deficiency in which goitre and other deformities are seen. It is found chiefly in certain parts of Switzerland, where the writer has seen cases in which the goitre was so large as to require a support.

Imbecility is a condition of mental weakness which comes upon an individual born with a healthy brain. It frequently follows infantile convulsions. It is very often the result of softening of the brain, or hydrocephalus. All degrees of mental deficiency are shown by imbeciles. They generally eat voraciously, are very mischievous in disposition, frequently destroying whatever they can get their hands upon. Imbeciles do not show the peculiar deformities noticeable in idiots, being born in a normal condition.

Much attention has been given to the study of the causes of idiocy and imbecility. The best authors attribute idiocy chiefly to two causes,—intemperance and marriage of relatives. Plenty of instances have been observed in which idiotic children are the offspring of intemperate parents. Morel, who has investigated this subject very thoroughly, shows the connection between habits of vice and intemperance and idiocy as follows: "In the first generation there is alcoholism and immorality; in the second, hereditary drunkenness, maniacal outbursts, and general paralysis; in the third, sobriety, homicidal mania, melancholia, confirmed mania, homicidal tendencies; in the fourth, feeble intelligence, stupidity, early mania, idiocy, and, finally, extinction of the stock."

Statistics have also been collected to show that the marriage of nearly related persons, as of cousins, has a marked tendency to produce idiocy in the offspring. Recent investigations have shown that this tendency does not necessarily exist on account of individuals being relatives, only as each one possesses similar tendencies, which, by combination, are intensified. The danger in the marriage of relatives is that some lurking tendency of this kind will be, by intensification, brought out in the children. Fortunately, idiots and imbecile persons are usually sterile. A peculiar form of imbecility of a very low grade is produced in children by the use of narcotics, as of "Mrs. Winslow's Soothing Syrup," and similar quack nostrums containing opium.

Dr. Archibald, superintendent of a State asylum for feeble-minded children, asserts that he has found, by careful investigation, that self-abuse is a cause of a very large proportion of the cases of imbecility which come under his care.

Treatment.—Notwithstanding the apparently hopeless character of these cases, much has been done in modern times to ameliorate their condition. It has been shown, by actual experiment, that almost every case may be in some degree benefited by a persevering course of training, with good treatment. The most hopeful cases are those which are healthy in other respects, being free from epileptic fits, paralysis, and

other serious diseases of the nervous system. The prospect is most favorable when treatment can be begun at an early age, preferably not later than twelve or thirteen years. In several parts of this country, as well as in England, there now exist excellent institutions for the treatment of the feeble-minded, in which a systematic course of instruction and training is carried out, the excellent results of which are seen in many cases, by the rescuing of clouded intellects from almost total mental oblivion to a condition in which the individual is able to support himself by some form of simple labor. There is a marked tendency on the part of idiots and imbeciles to form vicious habits. Some years ago, we saw in a large hospital in New York City an idiot who was suffering with the worst form of venereal disease.

LEAD PALSY—WRIST-DROP.

Various nervous symptoms arise from poisoning the system with lead. These may be either slight or extremely severe. Among slight symptoms may be mentioned headache, dizziness, fullness and constriction of the head, all of which symptoms are aggravated by mental work. In many cases tremor is present, especially in the hands. The trembling is sometimes extensive, but generally consists in simply slight tremulous motions, especially when the muscles are contracting. In severe cases of lead poisoning, the patient may suffer with delirium, convulsions, or coma. One of the most common of all symptoms arising from lead poisoning is colic, which generally precedes the more severe phase. Lead paralysis, the subject of this article, is simply one of the symptoms which arises from plumbism, or poisoning from lead. The most common form of paralysis is what is termed "wrist-drop," in which the extensor muscles of the arm are paralyzed so that the patient cannot extend his arm or raise the wrist. The paralysis also extends to the flexor muscles, or those on the inside of the arm, as well as those on the upper side, but in a less degree. When the disease continues for some time, wasting of the muscles occurs and various distortions of the limb through contraction. The muscles of the limbs are also liable to be affected, as well as the muscles of respiration and other groups of muscles. The sensibility of the skin is rarely affected. Paralysis occurring through lead poisoning is distinguished from that originating otherwise by the fact that the individual has been exposed to this cause, and especially by the appearance of a bluish line around the edges of the gums. This disease occurs most often in persons who work with lead, as lead founders,

manufacturers of lead paint, painters, plumbers, printers, etc. Lead poisoning is also frequently produced by drinking water which has passed through lead pipes, or which has been stored in lead-lined cisterns or tanks, or collected from roofs covered with lead or lead-tin, or kept in vessels of lead or lead-tin. Smokers are exposed to lead poisoning by the use of cigars which have been wrapped in lead foil. The use of hair dyes containing lead is another very common cause of lead poisoning. In a case which we met some time ago, lead paralysis was produced in a young lady by the use of lead paint as a cosmetic. The use of lead plasters and lotions applied to ulcers or other surfaces, has resulted in lead poisoning.

Treatment.—In a majority of cases, this affection can be cured, provided the cause is removed. The use of electricity is indispensable, and, in bad cases, the galvanic current must be applied, as in most cases the paralyzed muscles cannot be made to contract by the faradic current. It is necessary to employ very strong currents in order to produce contraction. When contraction cannot be induced, the case is a hopeless one. Every attention should be given to the improvement of the general health. It is claimed that lead may be eliminated from the body by the use of iodide of potash. This drug should not be employed except under the care of a physician. Electricity may be used with benefit as often as every other day. It should be accompanied with shampooing, massage, and passive movements of the affected muscles. When contractions have occurred, various mechanical devices are sometimes necessary. Characteristic nervous symptoms are produced by the introduction into the system of mercury, arsenic, and various other drugs, the symptoms of which are described elsewhere.

ALCOHOLISM.

SYMPTOMS.—Tremor, and unsteadiness, especially of the upper extremities, after a time of the lower limbs, most marked in the beginning; loss of muscular power; great nervousness, which is temporarily relieved by alcoholic liquors; insensibility of skin; affections of the sight, hearing, smell, and taste; in some cases, convulsions of an epileptic character; spasmodic twitching of the muscles; greatly exaggerated nervous irritability; great irritability of temper; loss of intellectual and moral capacity.

The above are but a few of the train of symptoms which are present in the chronic form of alcoholic poisoning. These symptoms may occur only after the long-continued use of alcoholic liquors or after a short continuance of the habit, according to the temperament and other

conditions of the individual. The proper treatment consists in abandonment of the exciting cause, and improvement of the general health. Simply diminishing the quantity of liquor taken, will have little effect to relieve the disorders present in this disease. The patient must abstain entirely from the use of this subtle poison.

DELIRIUM TREMENS.

SYMPTOMS.—At first, loss of appetite, nausea, and vomiting, especially in the morning; either diarrhea or obstinate constipation; tongue coated and dry; great debility; pulse feeble and rapid; skin cold and moist; sleep unrefreshing, and disturbed by frightful dreams; patient generally wakeful; in most cases, headache and dizziness; more or less mental disturbance; confusion of ideas; trembling of the muscles, first noticed in the tongue when protruded. When fully developed, wild expression on the face; hallucinations, illusions, and delusions; patient frightened by horrid fancies, as of reptiles and terrifying objects seen all about him; entire absence of sleep; considerable fever; extremities cold; head greatly congested; patient talks incessantly; pupils strongly contracted; in some cases, convulsions.

Delirium tremens, although generally produced by the use of alcohol, is also sometimes occasioned by the use of tobacco, all the characteristic symptoms being present. The condition is one of intense poisoning of the nervous system, the nutrition of which is greatly interfered with. In delirium tremens from the use of alcohol, there is always present great congestion and often inflammation of the stomach, sometimes rendering the patient unable to retain food. In some cases the patient suffers with incessant vomiting for several days. The attack generally continues from three to five days. Ability to sleep is a very favorable symptom, as the patient generally awakes feeling refreshed.

Treatment.—The treatment of this disease by means of opiates, large doses of bromide of potash, chloral, etc., is very often unsuccessful, especially in severe cases. The best treatment consists in keeping the patient as quiet as possible, applying ice or cold pours to the head. The cold shower bath may be employed with advantage when the fever is high and cerebral congestion very great. When the patient refuses to eat, his strength may be sustained by the use of nutritive injections. See page 737. There is usually such a high degree of inflammation of the stomach that food will not be digested if eaten; and it would probably be well to adopt this plan of feeding in nearly all cases. The patient should be kept in a darkened room, and guarded against all avoidable disturbances. Great exhaustion results from

the violent muscular exertion generally made by the patient; these should be restrained as much as possible. When a sufficient number of attendants cannot be secured to hold the patient in bed, the arms and feet may be tied together by means of wide bands, as towels or sheets, thus rendering the patient much more easily controllable. When necessary, the straight jacket, shown in Fig. 323, which is frequently used in insane asylums, may be employed.

In the effort to reform persons who have been addicted to drink, the idea should not be entertained that any substitute for liquor can be found. Anything which would be a substitute for its effects would be equally as bad as the liquor itself. The much advertised "Cinchona Cure" is an unmitigated fraud. As prepared by Mr.. ——— the professed discoverer, it is simply an alcholic liquor, flavored with "red bark," one of the varieties of the Cinchona tree, from which quinine is obtained. Prof. Earle, physician to the Washingtonian "Inebriates' Home," in Chicago, has recently exposed the matter in a Chicago medical journal. He has traced the after-history of a number of drunkards whom ——— publicly claimed to have cured; but nearly all of whom have since been under Dr. Earle's treatment at the "Inebriate's Home." Not a single one was in the least degree improved by the "Cinchona Cure." Some of his mixtures contain as high as twenty-four per cent of alcohol, a larger proportion than is found in ale or most wines. The much vaunted Keeley Cure has likewise been the means of increasing drunkenness by encouraging young men to believe that they may find at any time in this miscalled "cure" an infallible remedy.

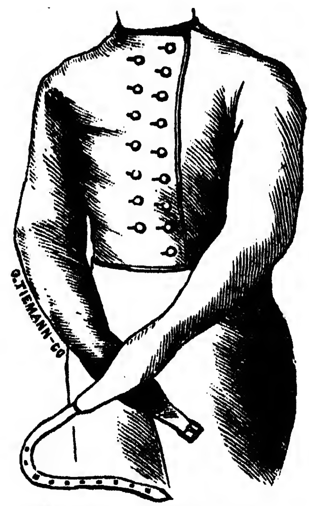


Fig. 323. Straight Jacket.

THE OPIUM HABIT.

As in the case of inebriety, opium-taking is at first merely a habit, but finally develops into a formidable disease. The morbid condition established by the long-continued use of opium is, if possible, even more serious than chronic alcoholism. This disease has been very appropriately termed opiism, or opiomania. The habit is in-

duced in the majority of cases by the use of opium for the purpose of relieving pain or inducing sleep. For nearly twenty years we have had, almost constantly, patients under treatment for the relief of this habit, and in tracing the history of these cases we have, in every instance, found that the habit had originated with a physician's prescription. This fact, together with many others to which attention has been called in the section on stimulants and narcotics, has convinced us that physicians generally are culpably reckless in the use of this powerful, fascinating drug. Opium is certainly a boon in cases in which it is absolutely required; but its use should be restricted as much as possible, and not resorted to when relief can be obtained by any other means. The suffering which patients generally undergo in their attempts to escape from the thralldom of this habit, are greater, in the majority of cases, than those for the relief of which the drug was originally taken. As a general rule, when the opium-taker begins to lessen the dose which has been gradually increased for a longer or shorter period, a great variety of morbid symptoms make their appearance. In many cases, obstinate vomiting or equally persistent diarrhea set in as soon as the daily dose is reduced. In other cases, the patient will be seized with violent sneezing. In still others, pains in the joints, or old neuralgic pains, to relieve which the opium was originally taken, render the patient almost distracted with suffering. But that of which these unfortunates complain most bitterly is a peculiar indefinable sensation, which is described by the patient as much harder to bear than actual pain.

Treatment.—The amount of opium which the system will tolerate after the habit has been continued for many years, is sometimes astonishing. We have had under treatment patients taking daily amounts varying from one or two grains of opium to forty-eight grains of sulphate of morphia, equivalent to more than half an ounce of the drug. In treating these patients, especially those by whom the quantity consumed was very large, the physician's skill and patience are often taxed to the utmost. In beginning the cure, it is of the first importance to convince the patient that much will depend upon his own efforts. His will-power and fortitude, which invariably become sadly demoralized by the long subjection to the habit, must be stimulated as much as possible. He must be taught the necessity of patiently bearing some pain, and enduring a considerable degree of suffering. This is often hard to do, as the fortitude to bear pain is, in most cases, almost wholly lost. In the

further carrying out of treatment, we have adopted several plans with success. In some cases, especially those in which the quantity of opium or morphia taken daily is not very large, we have obtained very excellent results by withholding the drug altogether for two or three days, or until the patient was entirely out from under its narcotic influence.

By this time, the sufferings of the patient will become considerable, and a small dose is then administered. It is found that a very small dose indeed, after the patient has abstained for two or three days, will generally produce as much effect as was produced by the full dose at the beginning of the treatment. After a day or two, the same process is repeated, each time the quantity of opium administered being diminished until finally it is left off altogether. When the patient has a great deal of will-power, and is willing to make the attempt, especially when the amount of opium taken is moderate, the drug may be wholly discontinued from the first. In general, however, it is better to diminish the amount of the drug by degrees, quite rapidly at first, and more slowly afterward. This should not be left to the patient, however, as very few have the moral courage to conduct the treatment successfully. The patient should be deprived of every particle of the drug, and of all means of access to it, and the daily amount should be administered at a regular hour each day in a gradually diminishing quantity. We have, in some cases, slowly diminished the quantity of the drug until it was finally left off entirely without the patient being aware of the change. In one case, the hypodermic injection of pure water was continued for several weeks, producing precisely the same effects which had before been produced by the usual dose of the drug, illustrating the powerful effect of the imagination upon the body. We have found the employment of electricity in the form of galvanization of the spine, general faradization, electro-thermal baths, together with massage, warm baths, and other hygienic measures, of very great use in mitigating the sufferings of patients undergoing cure of the opium habit.

THE TOBACCO HABIT.

This habit, when thoroughly fixed upon an individual, is scarcely less difficult of abandonment, in many cases, than the use of opium. Some persons are able to renounce their accustomed pipe or cigar at once, even after the habit has been indulged for many years, while others are only able to succeed after repeated attempts. We do not need to consider here the evil results of the tobacco habit, as the subject has been thor-

oughly discussed under the head of "Stimulants and Narcotics," to which the reader is referred.

Treatment.—The secret of success in the treatment of the tobacco habit, is in relieving the system entirely from the influence of the drug as quickly as possible. This is best done after the patient has discontinued the habit, by the use of hot-air, vapor, Turkish, and Russian baths, or by the use of the wet-sheet pack. The last-named remedy is quite as effective as any of the others. The odor of nicotine can be distinguished in the perspiration of a patient long accustomed to the use of tobacco, for several days after the habit has been discontinued. Electricity, preferably in the form of galvanization of the spine, fomentations to the spine, leg baths, with cold applications to the head, fomentations over the stomach and liver, warm baths, and dry hand rubbing are effective measures of allaying the nervousness from which many patients suffer, after dispensing with their usual quid or cigar. We have treated hundreds of patients for the tobacco habit, and have rarely failed to obtain complete success by the above measures, well backed up by the co-operation of the patient, within a week or ten days. Substitutes for tobacco are utterly worthless. As was remarked with reference to substitutes for alcoholic drinks, anything which would produce the same effect would be equally detrimental, and nothing else would be accepted by the tobacco-user as a substitute. The so-called substitutes which are now sold quite extensively, undoubtedly contain a considerable proportion of tobacco. At least, this has been the case with those we have examined.

THE TEA AND COFFEE HABIT.

Individuals sometimes become as thoroughly enslaved to the use of strong tea and coffee as do other persons to the use of tobacco, liquor, or opium. An English physician has recently called attention to the fact that "tea-drunkards" are becoming quite common among ladies in that country. The effects of the tea-and-coffee habit have been fully described elsewhere. The treatment consists in their thorough abandonment, with the determined resolution never to resort to their use under any circumstances. Most persons can readily overcome the habit by gradually diminishing the strength of the beverage, and then substituting wheat or bran coffee, crust coffee, clover tea, or some similar drink equally innocent. The severe headache, lassitude, and general depression of which ladies sometimes complain when deprived of their accustomed

cup of tea or coffee, affords the strongest evidence of the injurious effect of these beverages.

These symptoms may generally be relieved by the application of fomentations to the back of the neck or shoulders, with a hot foot bath, and fomentations over the stomach. The application of either form of electricity to the back of the head or spine will also generally give speedy relief to these symptoms. If nothing whatever is done, they will soon vanish, and the improvement in digestion, in nerve power, and in many other directions, will soon convince patients of the injury which they have suffered from these useless and harmful drinks and the benefit to be derived from their disuse.

FATTY DEGENERATION OF THE NERVES.

This is a morbid process in which the proper nerve substance is gradually removed, fatty particles being deposited in its place. A nerve which has undergone fatty degeneration has lost its power to transmit nerve sensations or nerve force. Nerve cells undergo this process, as well as nerve fibers, thereby losing the power to generate nerve force. An organ, the nerves of which have undergone fatty degeneration, is paralyzed. The same is true if fatty degeneration has taken place in the nerve centers from which the nerve supplying the organ originates. Softening of the brain is a form of fatty degeneration. A nerve which is cut off from its connection with the nerve centers generally undergoes this change in a short time. Nerves which are not used, in consequence of paralysis from injury to some part of the brain, often rapidly undergo degeneration. The causes of fatty degeneration of the nerves, are the use of alcoholic liquors, the use of tobacco, gluttony, habits of dissipation, deficient exercise, and various diseases.

Treatment.—The treatment is chiefly preventive, since repair of the nerves is impossible when extensive changes have once taken place. The use of electricity, and systematic exercise of all the paralyzed parts, are the best means for preventing or checking the progress of this disease.

DISORDERS OF SPEECH.

We have already considered loss and impairment of the voice from disease of the vocal apparatus and from paralysis of the nerves which control the muscles of speech, under the head of "Aphonia." We have now to consider other disturbances of speech which arise from disease of

some part of the nervous apparatus involved in speech production. Of the numerous disorders which have been described by systematic authors we will mention some of the most important.

Aphasia.—This is a condition arising from a disease of the brain which occasions loss or impairment of the idea of language or its expression. It differs from aphonia in that in the latter disease, speech is impaired or lost from disease of the vocal apparatus, although the memory of words and the power of expressing them by writing remains unimpaired, while in aphasia the vocal apparatus remains intact, but the memory of words and the power to use them is destroyed or impaired.

The most common cause of aphasia is injury to the brain from apoplexy. The portion of the brain supposed to be injured in these cases is a part called the "island of Reil" on the left side of the brain. It is thought that the memory of words and control of the organs of speech reside chiefly in the left side of the brain, from the fact that in nearly all cases in which aphasia results from injury of the brain, examinations after death have shown the injury to be on the left side. This is not always found to be the case, however, and it is probably true that both sides of the brain possess this faculty, but that from force of habit, the left side is chiefly used, just as one eye, one hand, or one ear is generally employed in preference to the other. It has been claimed that in right-handed people aphasia is due to injury of the left side of the brain, while in left-handed people it is to be attributed to injury on the opposite side, owing to the well-known anatomical fact that the nerves of the right side of the body originate in the left side of the brain, and vice versa.

A person suffering with aphasia may be unable to utter a syllable, or may simply be deprived of the power of using words correctly. Sometimes the power of speech will be lost, while the memory of words remains, so that an individual can write as well as ever. This is not generally the case, however. Patients are sometimes aware of their inability to use words correctly, and at other times seem to be wholly oblivious to the mistakes they are constantly making. We recently had under treatment a patient suffering with this difficulty as a result of apoplexy. If she wished to say door, she was much more likely to say chair, table, carpet, or window. Apparently aware of the mistakes made in speaking, she often repeated a long list of names, hoping to find the right word. If the desired word was suggested to

her, she would at once recognize it, and would repeat it without difficulty. Aphasia sometimes results from epilepsy, hysteria, and various other functional disturbances of the brain.

Treatment.—The treatment of aphasia consists chiefly in the treatment of the cause from which it arises. Unfortunately, this cannot always be removed, so that in many cases complete recovery is impossible. However, much benefit may often be derived from a persevering effort to cultivate the speech organs of the opposite side of the brain, which may, in many cases, by long effort be developed to a considerable degree of utility. In order to accomplish this, it is often necessary to pursue a course of systematic instruction, beginning with the letters of the alphabet, the names and significance of which must be learned as in first learning to read. The application of electricity, both galvanic and faradic, to the tongue and muscles of the throat is a remedy of considerable value. Functional aphasia can be entirely cured by relief of the difficulty upon which it depends.

Stammering.—This difficulty is an inability to pronounce letters properly. This is sometimes the result of defects in the organs of speech, such as cleft palate, paralysis of the soft palate, tongue-tie and other deformities of the tongue, hare-lip, deformity of the teeth, etc. Enlarged tonsils may also be included among the causes of stammering. The difficulty is also not infrequently acquired. It naturally exists in children, in whom, as well as in cases in which the difficulty is very considerable, it is termed "lalling." A very frequent cause of the acquirement of this form of defective speech, is talking "baby talk" to children, and thus preventing them from forming correct habits of articulation. The defects of articulation shown in the speech of children should never be imitated by their attendants. Great pains should always be taken to speak to them in clear and distinct tones, so that they may be led to form correct habits of utterance. This is very important, since it is impossible for most adults to utter many sounds which are not learned during early life, even though they might have been acquired at that time. The learned Kussmaul remarks that "no living man is able to pronounce the speech sounds of all the nations of the earth. A Lepsius may succeed in expressing them in letters, and a Bruecke may unravel the mechanism of their articulation, but it is beyond the power of even such erudite philologists to articulate them all." There is a great difference in the number of sounds possessed by different languages ; for instance, the

number of consonant sounds in Hindostanee is forty-eight, more than double the number in the English language, which is but twenty. The Greek language contains but seventeen consonants, and some Australian languages are said to have but eight. Some languages are entirely wanting in whole classes of sounds ; for instance, the languages of the Mohawks, Senecas, Hurons, and of a number of other Indian tribes, do not contain the sounds *p*, *b*, *f*, *v*, *w*, and *m*, and consequently have not the words "mamma" and "papa," found in almost all other known languages. According to Tylor, when the attempt was made to teach the Mohawks to pronounce words containing these letters, they declared that they would not make themselves ridiculous by attempting to speak with their mouths closed. This peculiarity of different languages is the occasion of the difficulty often met with by persons of different nations in attempting to learn the pronunciation of other languages; for example, the Chinese, having no *r*, in the attempt to pronounce the word "America," substitute an *l* for the *r*, and render it "Ja-ma-li-ka." The German language abounds in gutteral sounds, the French in nasal vowels, the Russian in hissing sounds, such as *tsch* and even *schtsch*. In Africa, tribes are found whose language abounds in clicking sounds, and certain tribes of Indians delight in the expression of grunting, gurgling, and chuckling sounds.

Treatment.—The treatment for stammering consists in the performance of a proper surgical operation, in cases in which the difficulty can be remedied in this way, and proper training when the difficulty is due to acquired habit.

Stuttering.—Stuttering and stammering should not be confounded, as they are distinct forms of speech disturbance. In stuttering, there is no lack of ability to pronounce sounds distinctly, but a want of power to combine sounds together in forming syllables and words. Single sounds can be articulated without difficulty, but when the patient attempts to speak, an impediment occurs. The impediment consists in spasmodic contraction of some of the muscles involved in the production of sounds. The impediment may show itself as soon as the patient begins to speak, or not until several words have been uttered. It is most likely to occur when the word which the individual attempts to pronounce begins with a consonant, especially with an explosive sound. In very severe cases, the sufferer, in his attempts to utter an explosive sound, sometimes works himself into a state of great agitation, his heart palpitates, his face becomes red with conges-

tion, profuse perspiration breaks out, and he presents an almost maniacal appearance. The paroxysm often continues until it becomes necessary for the patient to take breath. When the attempt is renewed, or it may be just as the patient is almost exhausted, the refractory organs perform their function, and the required sound is produced. In mild forms of the affection, there is simply the repetition of particular letters or syllables.

This affection presents many peculiarities, among which is the fact that stutterers can often sing or whisper without difficulty. Many persons affected in this way have no trouble in speaking when alone, in the dark, or when with persons with whom they are intimately acquainted.

Anything which increases nervous excitability, greatly exaggerates the difficulty. In one case, the patient was entirely unable to speak a word when exhausted by a night's watching. Very frequently the stutterer will speak with perfect distinctness when asked to stutter. Stuttering is generally more marked in the morning than in the evening. In some countries the affection is quite common. Statistics show that in France there is one stutterer for every thousand persons, and in ten years nearly seven thousand persons were exempted from military service on account of stuttering. It is still more frequent in Germany. It is said that stuttering is wholly unknown in China, a fact which is undoubtedly due to the rhythmical character of the language. A curious fact is mentioned by Colombat, who states that a Frenchman who learned Chinese was able to speak the acquired language with fluency, although he stuttered badly in his native tongue.

A tendency to stutter seems to be hereditary in families. The habit is often acquired by association with stutterers. It occurs about ten times as frequently in males as in females, and is most common in persons of nervous and excitable disposition.

Temporary stuttering is sometimes produced by dissipation, smoking, indigestion, loss of sleep, and other causes which produce great nervous exhaustion. Stuttering and stammering may be combined in the same individual, although the two diseases are distinct.

Treatment.—The treatment of this difficulty involves the removal of the causes, so far as possible, by the improvement of the general health, by tonic baths, nourishing diet, and exercise, especially lung gymnastics, Swedish movements, and tonic applications of electricity. The direct treatment of the disease itself begins with exercises in breathing. Some

require the patient to spend a week in absolute silence before beginning exercises of any sort. The first thing to be learned by the stutterer is how to fill his lungs completely, and then to expire it slowly and steadily. After this power has been acquired, the patient should be practiced in the pronunciation of all the different vowels, both singly and in combination. He must be made to speak them in loud tones, prolonged as much as possible, to speak them in a louder than ordinary voice, and in a whisper. He should also be taught to sing them, and to continue practice with each vowel in combination until he acquires perfect confidence in his ability to pronounce them all. This acquirement of confidence in himself is one of the essentials of treatment. Without it, a cure cannot be effected.

The next thing to be accomplished is the acquirement of power to combine consonants and vowels. This should be done by practice, first, in combinations in which the vowel comes before the consonant; and when this has been mastered, combinations in which the consonant comes first should be practiced upon. All the while the most careful attention must be given to the respiration. By degrees the patient will become able to pronounce words of one syllable, afterward the ability will extend to the pronunciation of words of two or more syllables, and then to combinations of words, and finally to sentences, periods, and paragraphs. Phrases and short combinations of words must first be spoken like words of many syllables. When the patient reaches this stage of improvement, he should be practiced in reading aloud, first poetry and then prose. After a time, he may be allowed to repeat short pieces of poetry or prose which have been committed to memory. After two or three months, a series of exercises should be given in which the pupil should be taught to keep time, speaking very slowly and giving to each syllable the same length, drawing breath whenever there is a grammatical pause. This regulated speech must be continued for months.

During all this time, the patient must never allow himself to speak otherwise than he has been taught to do in the exercises. When he finds himself unable to speak without stuttering, he should keep silence. The employment of measured or rhythmic speech should be resorted to whenever he finds himself getting excited in conversation. Relapses are very likely to occur, which necessitate a new course of treatment.

Many mechanical devices have been adopted for the relief of stut-

tering. It is said that Demosthenes spoke with stones under his tongue. Little wooden plates, shaped like the lower jaw, "tongue forks," or "tongue bridles," and a great variety of other contrivances have been invented and used for this purpose. This plan of treatment is rarely successful and often does harm. It never effects a permanent cure. Various surgical operations have been performed for the relief of stuttering, but never with permanent benefit.

A peculiar affection somewhat resembling stuttering, known as *aphthongia,* has been occasionally observed. It consists in a spasm of the tongue, mouth, and jaw, whenever the patient attempts to speak. This difficulty is fortunately very rare, for no special means of relief has yet been devised.

SEASICKNESS.

SYMPTOMS.—Headache; dizziness; nausea and vomiting, with severe retching; great prostration.

This disease generally occurs in persons who are taking a voyage at sea, or on any large body of water. The symptoms exhibited are essentially the same in character and originate from the same cause as those which result from whirling, riding on the cars, or riding backward, being undoubtedly due to the disturbance of the brain, which results from the unusual and irregular impressions received from the senses of sight and touch. When occurring at sea, the disease is undoubtedly aggravated by the foul odors frequently present in the close, unventilated apartments of the ship. Undoubtedly, the rich and unwholesome food generally used on shipboard has much to do with the production of seasickness. Fortunately, the disease is very rarely fatal in itself, although the violent retching has, in some instances, produced hemorrhage from the stomach which has resulted in death.

Treatment.—A person preparing to take a sea voyage should eat very sparingly of the simplest and most wholesome food for at least three or four days before going on shipboard. After going on board, he should retire to his berth before the peculiar motion of the ship becomes in any very great degree noticeable. He should remain in a horizontal position most of the time for the first twenty-four hours, eating chiefly dry and very simple food, as graham or oatmeal crackers, dry toast with a little fruit. Liquids, if taken, should be either cold or quite hot. Slight qualmishness, if it occurs, may be relieved by swallowing a few bits of ice or taking a few sips of hot

lemonade. Nothing highly seasoned should be taken into the stomach during the voyage. Fried food, cake, pastry, lard biscuit, and all similar substances should be strictly prohibited. It is also best to abstain from the free use of meat. After the first day or two, it will be safe to venture upon deck. The precaution should be taken to protect the body thoroughly from the cold, moist air by warm wraps. Many persons find themselves entirely free from seasickness while upon deck, only feeling sick when confined within the close, poorly-ventilated apartments below. Wearing a tight bandage about the abdomen is recommended by sailors as a preventive of seasickness. Some physicians recommend the use of pickled oysters, ham, and smoked herring, and the free use of cayenne pepper, spice, and mustard, which advice we would earnestly exhort our readers to ignore.

A diet consisting of granose (see Appendix) eaten dry, with fresh fruit, is to be highly recommended as a preventive of seasickness. Granose is put up in convenient packages, from which it should be transferred, however, to glass cans so it may be kept free from exposure to the air. It should be well heated before putting into the cans, to exclude all moisture. By this means it is rendered very crisp and palatable, and will keep indefinitely.

A measure of treatment which is of the highest value as a means of controlling seasickness is the following: Let the individual on approach of the first symptom of seasickness, at once repair to his stateroom, arrange for as good ventilation as possible, go to bed, place an ice-bag to the back of the neck, and having arranged with the steward for a renewal of the ice in the bag, close the eyes and keep as quiet as possible. This plan is so successful that persons who have adopted it by the advice of the writer, have reported themselves almost free from this disagreeable accompaniment of ocean travel. We can also recommend the method from our personal experience.

DISEASES OF THE URINARY ORGANS.

SYMPTOMS RELATING TO DISEASE OF THE KIDNEYS AND BLADDER.

Retention of Urine.—This symptom occurs more often in males than in females, owing to the greater length of the urethra, or passage through which the urine escapes from the bladder. It frequently results, especially in females who are somewhat hysterical, from nervousness. In males, it may be the result of enlargement of the prostate gland or irritability of the urethra, causing contraction of the mouth of the bladder. The worst forms of retention are due to paralysis of the bladder, stricture, or permanent contraction of the urethra.

Treatment.—Mild cases of retention can generally be relieved by the prolonged warm sitz bath, and fomentations over the lower part of the back and abdomen. When retention is due to the spasmodic contraction of the urethra or of the sphincter of the bladder, relief may be often given by pouring a small stream of water into a vessel while the patient is making the attempt to pass water. With females, relief may often be obtained by giving the patient a vaginal douche when the attempt to pass water is made.

In case relief is not soon obtained by these measures, a physician should be called to relieve the bladder by means of a catheter, a small tube which is passed into the bladder through the urethra.

It is important to recollect that the bladder naturally requires to be relieved at least two or three times during the twenty-four hours, and more than a few hours should never be allowed to elapse without relieving it, as it may become paralyzed by over-distention. In case of severe injury to the head or the spine, apoplexy, and all conditions in which the patient is unconscious, or partially paralyzed, careful attention should be given to relieve the bladder at proper intervals.

Suppression of Urine.—This condition differs from the preceding in that it is a diminished production of the urine by the kidneys, instead of being a retention by the bladder. This is a very serious symptom, indicating inactivity of the kidneys from congestion, acute or chronic disease, or conditions present in such diseases as typhoid fever, cholera, and other diseases characterized by great debility. The

danger to be apprehended in this condition is the poisoning of the system from the retention of the various poisonous elements which should be eliminated from the blood by the kidneys.

Careful attention should be given to the amount of urine passed by patients or removed by means of the catheter. The amount usually passed in health is from a pint and a half to three pints. A much smaller quantity than twenty-four ounces or a pint and a half should be considered as a serious symptom.

Treatment.—If the attack is an acute one, relief may often be obtained by giving the patient a sweating bath of some sort, as a hot air or vapor bath, or a warm blanket pack. Fomentations across the small of the back applied continuously for an hour or two, or until relief is obtained, is also a very excellent measure. If fomentations are not successful, alternate cold and hot applications may be employed. In case the disease is chronic, the patient should be kept in a state of active perspiration. Employ also hot water drinking and the hot enema.

Painful Urination.— This is a symptom which accompanies many diseases of the bladder and urethra. It is due to an irritable condition of the mucous membrane of the urethra or bladder. It may often be much relieved by the daily use of the sitz bath or the prolonged vaginal or the bladder douche. Dilatation of the urethra, the use of the self-retaining catheter, or the removal of some morbid growth at the mouth of the urethra, are other measures required in special cases.

Frequent Urination.—A frequent desire to pass water is generally due to an irritable condition of the bladder in consequence of chronic catarrh of this organ. It may also be due to sympathy with irritation in the rectum, uterus, or other organs. Enlargement of the prostate gland is one of the most common causes of this symptom in old men.

The difficulty can only be relieved by treatment of the disease upon which it depends. It is generally mitigated either by warm fomentations over the abdomen, prolonged sitz baths, or, in women, a vaginal douche. (See further under "Incontinence of Urine," "Acute and Chronic Cystitis," and "Irritability of the Bladder.")

Scanty Urination.—If the quantity of urine is much less than one and a half pints, or more than three pints, in twenty-four hours, there is occasion to suspect that some disease may be present.

This is a very frequent symptom in fevers. The urine when scanty is also very high colored and often contains a sediment. The amount

of urine is diminished when the skin is very active, as in the summer time in persons who perspire very freely. A sudden cold will not infrequently produce a scanty and high colored urine.

Excessive Secretion of urine may be due to diabetes, or to chronic disease of the kidneys. It is also sometimes occasioned by less serious conditions, as by extreme nervousness, great mental anxiety, and various temporary conditions.

Color of the Urine.—The natural color of the urine varies from a light straw color to a yellow brown. The color is derived from the coloring matter of the blood. When the urine is abundant, its color is light; and when scanty, it is high colored.

In disease and various morbid conditions, the urine may become entirely colorless, or it may be deep red, green, blue, or olive color. In some cases, it even has a blackish hue. The deep red color is often present in fever. Olive color occurs in jaundice, and is due to the presence of bile in the urine.

When bile is present, the foam produced by shaking the urine in a bottle also has a deep yellow color. The presence of bile may be detected by placing a few drops of urine upon a piece of white porcelain or in a saucer, and adding a few drops of nitric acid. Rings of color will be seen spreading out from the point where the drop of acid was added. Various changes occur. The play of colors begins with green, and passes through olive, violet, blue, and red or yellow. The green color is characteristic of bile.

A dark brown or black color present in urine when passed, is due to blood in the urine. A black color appearing some time after the urine is passed, is not particularly significant. Blue and green colors are very rarely seen. They are sometimes observed in cases of chronic inflammation of the kidneys. Peculiar coloration of urine is often induced by the use of medicines of various kinds. Black color is produced by carbolic acid and creosote. The urine is colored yellow by rhubarb and santonine. Senna gives to it a brown color, and turpentine, violet.

Odor of Urine.—The urine in health has a characteristic odor peculiar to itself. Peculiar odors are frequently produced by articles of food, as garlic. Turpentine and other medicines also produce unnatural odors. The urine in dyspepsia often has a very offensive odor.

Diabetic urine has a smell resembling that of apples. When urine is retained long in the bladder, allowing decomposition to take place,

or when decomposition occurs in consequence of inflammation, the urine has a pungent odor, due to the formation of ammonia.

Taste of Urine.—In health the urine has a peculiar salty taste. A bitter taste indicates the presence of bile, and a sweetish taste, that of sugar. This test is seldom applied to the urine, but enthusiastic investigators of the diseases indicated by the urine, do not hesitate to resort to it. When either a bitter or sweet taste is observed, the chemical test for bile or sugar should be made.

Reaction of Urine.—By reaction is meant the condition of urine as to acidity or alkalinity. This is determined by test paper for the purpose. Alkaline urine turns red paper blue. Acid urine changes blue paper to red. In health, the urine is naturally slightly acid, especially in persons who employ a flesh diet. It is noticeable that animals whose diet is made up wholly of vegetables have alkaline urine, while in carnivorous animals, whose diet is made up almost wholly of flesh, the urine is very strongly acid.

Persons who eat much meat, have a very acid urine, while in those who subsist upon vegetables, the urine is only very faintly acid, is neutral, or distinctly alkaline. This fact should be remembered by persons who are subject to gout, rheumatism, neuralgia, and various nervous diseases, which are known to arise from a superabundance of acid in the blood, or, at least, are associated with a very acid state of the urine. Very acid urine is also likely to produce gravel or stone in the bladder, catarrh of the bladder, irritation of the urethra, and various other diseases of the urinary organs. Great acidity of the urine generally gives rise to a brick dust deposit when the urine is allowed to stand a short time. The fine, reddish particles composing this deposit are crystals of uric acid.

Great alkalinity of the urine sometimes occurs in consequence of decomposition taking place in the bladder. This occurs most frequently in chronic catarrh of the bladder, and in cases in which the bladder is not completely emptied as frequently as it should be. When this condition exists, the urine will have a very unpleasant and distinct ammoniacal odor, as though it had stood for a few hours in a warm room.

Acidity of the urine is relieved by the treatment to be presently recommended for uric acid. An excessive degree of alkalinity will be relieved by the proper treatment of the disease to which it is due.

Density of Urine.—By density is meant the specific gravity of

the urine, which is determined by an instrument for the purpose, called a urinometer. As the density of urine varies considerably during the twenty-four hours, being particularly great an hour or two after meals, the test should be applied to the whole amount of urine secreted in the twenty-four hours.

When this cannot be done, the first urine passed in the morning should be tested. The specific gravity of the urine in health is 1.015 to 1.025; when the urine is very abundant in quantity and of light color, its specific gravity is usually low; when scanty and high colored, the density is high.

Urinary Toxicity.—The urinary secretion contains the residuum of the tissues. The most abundant element—urea—was formerly supposed to be the principal toxic or poisonous substance which it contained; but recent investigations have shown the fact that the urinary secretion contains at least a half dozen poisons of much greater importance than urea, although far less abundant, and difficult to detect by chemical means. Prof. Bouchard devised a more delicate method, that of injecting a portion of the urine under examination, into the veins of a rabbit. The greater the amount of poisons contained in the urine, the higher the toxicity; and the larger the amount of urine required to kill the rabbit, the lower the toxicity. In certain diseased conditions, the urinary toxicity is found to be greatly increased; in others, very greatly diminished. Both conditions are highly significant. When the toxicity is high, the indication is that the stomach is producing or receiving toxic substances in excess; when the coefficient is abnormally low, the indication is that toxic substances are accumulating within the body, the kidneys failing to eliminate the normal quantity of poisonous elements.

Urinary Deposits.—Healthy urine is perfectly clear when it is first passed, although it may present, on standing for some time, a slightly clouded appearance. In various diseases, however, which are greater or less departures from health, the urine contains, after standing, a sediment which varies in color and character according to various circumstances which we will not now explain. On examination by means of various chemical tests and the microscope, this sediment is found to be composed, in the majority of cases, of one or more of the following substances: *Uric acid, urates, phosphates, oxalate of lime, blood, mucus, pus, or matter, epithelium,* and *casts.*

Uric Acid.—Fig. 324 and 325. A deposit resembling brick dust in color, or a fine, reddish sand, consists of uric acid.

If the sediment is formed before the urine is passed, as is indicated by the presence of a deposit in the vessel immediately after the passage of the urine, the presence of gravel or stone in the bladder may be strongly suspected. A brick-dust deposit in the urine is probably chiefly due to inactivity of the liver, as it is the proper duty of this organ to convert uric acid into urea, a form in which it is soluble and never appears as a deposit.

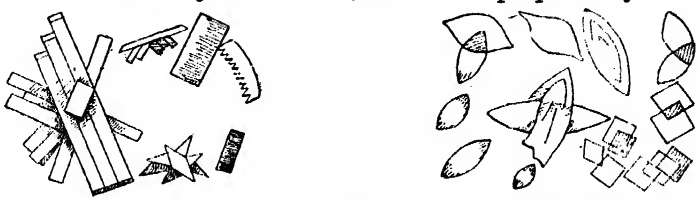


Fig. 324. Crystals of Uric Acid. Fig. 325.

Treatment.—A patient who has a brick-dust deposit in his urine should abstain from the use of a flesh diet, eating chiefly fruits and grains. Milk may be used in moderate quantities, and eggs and fish may be allowed occasionally; but the less the quantity of meat eaten, the better.

Such treatment should be taken as has already been recommended for torpid liver, which is probably a principal cause of this condition, in addition to the excessive use of meat.

Urates.—A deposit of urates in the urine produces a turbid appearance. The color varies with that of the urine; may be white, yellow, pink, or red. It is noticed only after the urine is cold, and may be distinguished by the fact that it disappears when the urine is re-heated. Urates are sometimes deposited in the bladder, especially in young children, and may be a cause of stone in the bladder. When this is the cause, the urine may be turbid when it is passed. The principal causes of this deposit are, feverish condition of the system, dyspepsia, great exhaustion from overwork, or dissipation. Taking cold is the most common of all causes of urinary deposits.

Treatment.—Avoidance of the causes is of course the first and most essential element of treatment. Beer, wine, tobacco, and all kinds of narcotics or stimulants should be wholly avoided. Little animal food should be used. The patient's diet should consist chiefly of fruits and grains, and he should practice the free drinking of water,

taking one or two glasses before breakfast and an equal quantity before going to bed at night.

Phosphates.—Fig. 326. This is a white sediment which is found in alkaline urine. It is distinguished from urates by not being dissolved when the urine is heated. It is, however, dissolved by acids.

It is chiefly caused by smoking, by the use of alkaline medicines, excessive mental strain, nervous prostration, sexual excesses, especially self-abuse, and occasionally by excessive use of some articles of food, especially sweet fruits. When present in the urine when passed, it indicates decomposition of the urine in the bladder. This is one of the common causes of stone in the bladder. When present continuously, it generally indicates nervous disorder of some form.

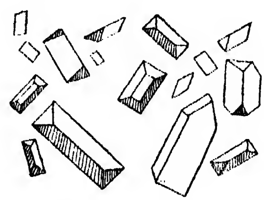


Fig. 326. Crystals of Triple Phosphates.

Treatment.—The treatment of this condition consists chiefly in the avoidance of the causes and removal of the diseased conditions upon which it depends.

Oxalate of Lime.—Fig. 327. This deposit is discovered only by means of the microscope. It is chiefly found in men, and generally occurs in patients suffering with indigestion, palpitation of the heart, irritable bladder, gloomy and irritable disposition, also often accompanies impotence. When very abundant, it may be the cause of a variety of stone in the bladder, known as mulberry calculus.

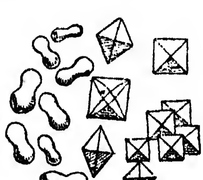


Fig. 327. Crystals of Oxalate of Lime.

Treatment.—The treatment consists in improved hygiene and cure of the disease upon which it depends. The patient should carefully avoid overeating, and the use of such articles of diet as are known to produce oxalates in the urine, such as rhubarb, raw apples, and most sweet fruits.

The use of hard water should also be avoided. Daily sponge baths, and the application of an inunction two or three times a week, together with the use of electricity, when possible, and massage, constitute the best treatment.

Pus in the Urine.—Fig. 328. The occurrence of pus in the urine is indicated by a deposit which closely resembles that of phosphates,

but which does not dissolve when heated with acids, as does the latter deposit. It sometimes has a ropy or stringy appearance. It is due to decomposition in the bladder. It indicates the presence of inflammation or ulceration in the kidneys, bladder, or urinary passages. It is a very serious symptom, to which intelligent medical attention should be called at once.

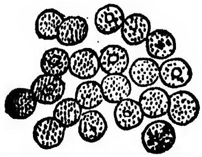


Fig. 328. Pus Cells.

Bloody Urine, or Hematurea.—Blood in the urine, or hematurea, is indicated by a deep brown, reddish, smoky, or even black appearance. It may be produced by hemorrhage from the kidneys, bladder, or urinary passages. It often occurs in Bright's disease and catarrh of the bladder.

Casts and Epithelium.—Figs. 329 to 331. When present in great abundance, casts and epithelial cells form a white, flocculent deposit after the urine has been allowed to stand for some time. They cannot be distinguished, however, without the use of the microscope.

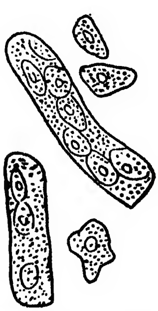


Fig. 329. Epithelial Casts.

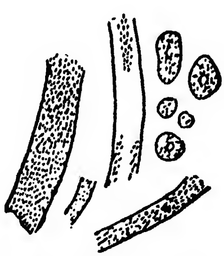


Fig. 330. Granular Casts.

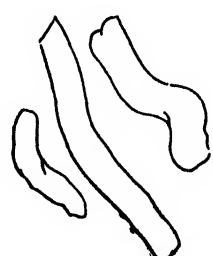


Fig. 331. Hyaline Casts.

Epithelium in great abundance indicates catarrh of the bladder. Casts of the small tubes of the kidneys indicate Bright's disease.

Chylous Urine.—A milky appearance of the urine sometimes occurs in consequence of the very abundant deposits of pus or phosphates.

Albumen.—Albumen in the urine is one of the most serious symptoms which this secretion presents. It usually indicates disease of the kidneys, and should never be neglected.

Sugar.—Sugar is less frequently found in urine than is albumen, but is always significant of a grave condition.

CONGESTION OF THE KIDNEYS.

***SYMPTOMS.**—Urine very abundant, pale, or scanty and high-colored; if scanty, containing albumen, and often blood; examination with a microscope shows casts, denoting catarrh of the kidneys; no pain.*

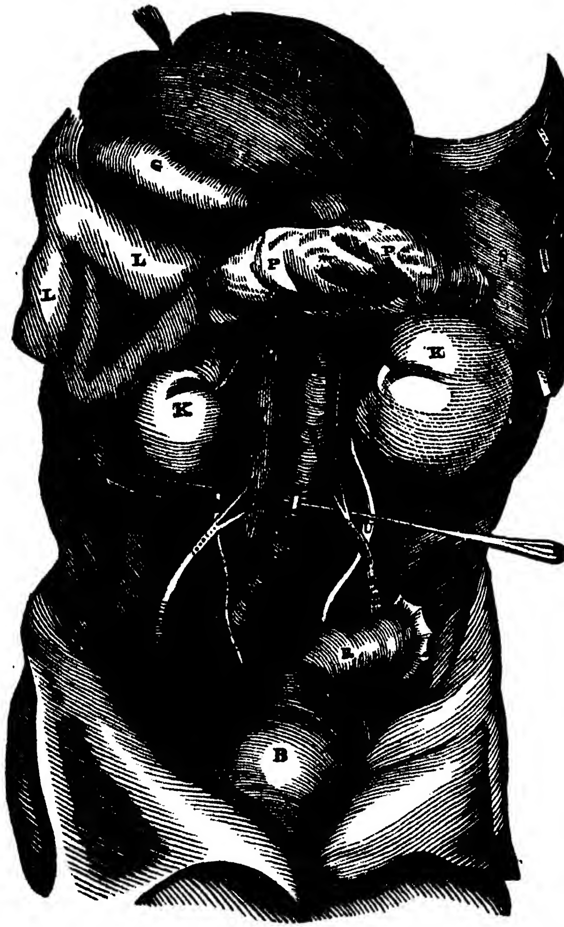


Fig. 332. Congested Kidneys.

Causes.—Due either to increased pressure in the arteries, as from hypertrophy of the heart, or to obstruction of the venous circulation. The first cause occasions an abundant secretion of urine; the second, scanty, high-colored urine. The disease is also caused by the various causes mentioned as productive of congestion of the liver, especially

by the free use of condiments, tobacco, tea and coffee, and alcoholic liquors. Lastly, as common causes, may be mentioned the use of irritating diuretic remedies, blisters, irritating salves, popular "kidney cures," the use of strong mineral waters, and dyspepsia.

Treatment.—As a general rule, when the urine is scanty and high-colored, the abundant use of water as a drink should be prescribed. Two or three pints of water a day will be none too much for most patients. If the stomach is injured by this excess of cold fluid, the water may be taken quite hot, which will facilitate absorption. The wet-sheet pack and vapor and hot-air baths are indicated when the congestion is considerable, together with fomentations over the kidneys, the abdominal bandage worn constantly, and the application of electricity to the small of the back. The diet should consist chiefly of fruits and grains. The less animal food eaten, especially meat, the better. Coffee, tea, tobacco, condiments, and everything which will give the kidneys extra work must be most carefully avoided. The use of various powerful diuretics in these cases, a very common practice, is in the highest degree detrimental. The use of barley-water, slippery-elm water, linseed tea, and various other demulcent drinks, is perfectly harmless, but no more beneficial than the use of pure water.

HEMORRHAGE FROM THE KIDNEYS.

SYMPTOMS.—Bloody urine, which coagulates when heated; bleeding excited by exercise; clots in the urine.

This disease cannot always be positively distinguished from hemorrhage of the bladder and other parts of the urinary organs, unless symptoms of suppression of the urine occur, such as nausea, vomiting, convulsions, or dropsy, as sometimes happens in consequence of the blocking up of the tubes of the kidneys with clots. As a general rule, however, clots are more frequent and abundant in hemorrhage from the bladder than in hemorrhage from the kidneys.

Causes.—Hemorrhage from the kidneys may be the result of accident, gravel in the pelvis of the kidneys, congestion, or renal apoplexy.

Treatment.—Apply cold over the region of the kidneys by means of ice compresses, or cloths wrung out of cold water. The cold sitz bath, and injections of cold water into the bladder, are also useful measures of treatment. In severe cases it may be necessary to restrict

the diet very closely. The patient should be kept very quiet. Heat should be applied to the extremities. The patient should receive tonic treatment and a very nourishing diet after the hemorrhage has ceased.

ACUTE INFLAMMATION OF THE KIDNEYS—ACUTE BRIGHT'S DISEASE.

SYMPTOMS.—Chill, followed by fever and sharp pain in the region of the kidneys; sometimes violent vomiting; frequent urination; suppression of urine; urine opaque, bloody, or of a dark or dirty brown color. Œdema, or dropsy, which changes from one part of the body to another, as from the face to the feet and ankles, or the reverse. Symptoms of suppression of urine, as convulsions, coma, etc. Examination with the microscope shows casts of the small tubes of the kidneys; albumin in the urine.

Causes.—This disease is a croupous inflammation of the kidneys, involving chiefly the small urinary tubes, which become blocked up, causing suppression of the secretion of urine. It occurs very frequently as a complication of scarlet fever, measles, diphtheria, typhus fever, and cholera. It may also occur in malarial fever.

When it occurs independently, it is commonly a result of exposure to cold, or the use of irritating diuretics or other irritating drugs, which affect principally the urinary organs, as balsam of copaiba, cantharides, and oil of turpentine.

There is every evidence to believe, also, that free indulgence in the use of alcohol, beer,—which is exceedingly stimulating to the kidneys, —and the excessive use of tobacco, are also causes of acute Bright's disease.

Treatment.—The essentials of treatment consist in fomentations to the small of the back; warm baths, followed by wrapping the patient in warm blankets, so as to continue the sweating; vapor baths, and hot-air baths.

These measures are, according to Niemeyer, much more effective, and much less likely to be attended by bad results, than the use of drugs to produce activity of the skin.

The Turkish and Russian baths, should, however, be avoided. The patient should practice drinking considerable quantities of water daily. Care should be taken that the water is pure and soft. When natural water answering these requirements cannot be obtained, well filtered water or distilled water should be used.

Condiments, tea, coffee, tobacco, and all spirituous liquors should be scrupulously avoided. Animal food should be used only to a very

limited extent. Meat may be better avoided altogether; also cheese and oysters. Milk, fish, and eggs may be used moderately.

One of the most important of all hygienic requirements is careful attention to the maintenance of proper warmth of the body. The patient should take care to avoid overheating of his apartments, securing also a plentiful supply of fresh air. He should be extremely careful not to venture out of doors in cold damp weather, at least without being so thoroughly protected as to make chilling of the body or even coldness impossible. Woolen clothing should always be worn next to the skin. Rest in bed is essential during the first stage.

The use of medicines and mineral waters which excite excessive activity of the kidneys is regarded by experienced physicians as a pernicious practice. The kidneys need rest, instead of overwork, and rest should be given them by compelling the skin to do as large an amount of their work as necessary, to relieve them as much as possible. The use of opiates is also extremely objectionable, as it diminishes the activity of the kidneys, and hence increases the liability to poisoning from the retention of urine poisons.

CHRONIC BRIGHT'S DISEASE.

SYMPTOMS.—Increasing debility; pallor; viscid urine; if the urine is shaken in a bottle, much froth, which lasts for a long time; urine coagulates with nitric acid, and when heated after adding acetic acid; whitish sediment containing casts; dropsical swelling of the face, feet, hands, and abdomen; bronchitis; watery diarrhea; pleurisy; peritonitis; œdema of the lungs; enlargement of the heart; valvular disease of the heart; frequently headache; when the disease is far advanced, nausea, vomiting, drowsiness, convulsions, coma; after attacks of coma, partial or complete blindness, due to rupture of a blood-vessel in the eye.

This disease is much more common than is generally supposed. It usually exists some time before its presence is known, as it is rarely accompanied by pain in the region of the kidneys, more often originating as a primary disease than following acute Bright's disease. The nature of the disease is such that the kidney gradually loses its ability to perform its duty. It is usually divided into three stages, in the first of which the organ is enlarged and pale of color. In the second stage, after degeneration has begun, it becomes yellow. The third stage is the stage of degeneration and atrophy in which the organ becomes almost useless as an excretory organ although it may continue to excrete large quantities of water.

Causes.— Among the causes known to be productive of this dis-

ease are exposure to cold and dampness, the use of tobacco and alcoholic liquors, and of irritating diuretics, as cubebs, copaiba, the use of strong mineral waters, "kidney cures," and the excessive use of meat. It also frequently occurs in consequence of chronic gout, syphilis, bone disease, dyspepsia, and malaria.

Treatment.—The same precautions respecting diet, clothing, etc., should be followed as prescribed for acute Bright's disease. Prof. Niemeyer and others have claimed excellent results from the use of an exclusive milk diet in this disease, without the use of medicines or any other remedy. The quantity taken is from two to three quarts daily. In many instances persons have greatly improved by this diet, dropsy and other symptoms being relieved in a remarkable degree. In one case, in which we used this remedy, the patient made very marked improvement, which has continued up to the present time, now nearly two years. Buttermilk has also been highly recommended as a diet remedy for this disease. The more closely the patient will confine himself to fruits and grains, the better it will be for him. Meat should be discarded altogether, and also coarse vegetables, such as asparagus, turnips, and cabbage. An aseptic diet (see Appendix) is absolutely essential in these cases. Buttermilk, granose, and simply prepared fruits and grains are especially to be recommended.

All possible measures should be employed to build up the patient's health, such as gentle exercise in the open air, sun baths, and tonic applications of electricity. It is also well for him to wear a moist abdominal bandage to encourage the activity of the liver, as well as kidneys. He should drink daily a considerable quantity of water, and care should be taken to keep the skin in as active a condition as possible. The best means for this purpose are the wet-sheet pack, hot-air bath, vapor bath, and inunction with vaseline, sweet oil or cocoanut oil, two or three times a week.

When the dropsical accumulation becomes very great, the hot-air bath should be used daily. In extreme cases, the sweating should be prolonged after the bath by wrapping the patient with warm woolen blankets, surrounding him with hot bags and bottles of hot water, and giving him warm drinks in abundance. In case vapor or hot-air baths cannot be conveniently employed, active sweating may be produced by covering the patient warmly in bed, and surrounding him with bottles of hot water, over each of which has been drawn a stocking wrung out of warm water. This is an excellent means of producing

vigorous sweating. It is known as Sir James Simpson's bath, having been first suggested by that eminent physician. When the patient has severe vomiting, give lemon juice in small sips, ice-cold or hot water, or allow him to swallow small bits of ice. Give hot water to drink freely, and large hot enemas. Applications of ice to the head, and alternate hot and cold rubbing of the spine by means of a sponge dipped in hot water and a small piece of ice, constitute the best means of combating the drowsiness and tendency to coma and convulsions. During an acute attack, absolute rest in bed is positively necessary. Avoid excessive fatigue, although gentle exercise is very beneficial. Exposure to cold should also be assiduously avoided.

ABSCESS OF THE KIDNEY.

SYMPTOMS.—Begins with chill, followed by fever; violent pain in the region of the kidneys, and increased by pressure, extending along the urethra to the bladder, and down the thigh; vomiting; urine scanty, highly colored, contains pus and blood; symptoms of suppression of the urine; when chronic, continued fever, and continued chills; gradual emaciation and increasing debility; tumor in region of kidney.

This is a somewhat obscure disease, and cannot, in all cases, be distinctly distinguished from some other affections of the kidney and its region. After existing for some time, a lump can usually be felt near the kidney. Spontaneous recovery from this disease is very rare, the patient usually dying from gradual exhaustion.

Causes.— Gravel; obstruction of the passage of the urine; extension of inflammation from the bladder; embolism, occurring in heart disease. The writer once removed a diseased floating kidney in which there was found a stone weighing 4½ ounces.

Treatment.—Fomentations over the region of the kidneys and the seat of pain, with cold applied during intervals when there is much local inflammation and general fever. Hot baths to induce perspiration, and copious water-drinking to wash away the products of inflammation from the bladder and urinary passages.

A vegetable and fruit diet. In severe cases, the exclusive milk diet may be tried. Washing out the bladder should be practiced daily, when there is much local irritation. For the relief of the fever, which is, in some cases, quite high, sponge baths should be frequently applied. In the majority of cases an opening must be made in the loin extending into the kidney, and proper drainage must be instituted by a surgical operation.

ABSCESS NEAR THE KIDNEY.

SYMPTOMS.—Symptoms similar to those of the preceding disease, only the urine is not affected; great pain; tumor felt in the side, just below the lower ribs; in some cases, sudden death.

In these cases, the abscess forms in the mass of fat in which the kidney is embedded, instead of in the organ itself.

Treatment.—When a tumor can be felt over the region of the kidney, at the back, which gives evidence of containing pus, it should be promptly opened, to prevent its discharging internally. Relieve the pain by the application of fomentations; a surgical operation is needed for the evacuation of the pus. Removal of the kidney is sometimes necessary.

FATTY DEGENERATION OF THE KIDNEYS.

SYMPTOMS.—Debility, gradually increasing; great pallor of face and skin, often accompanied by puffiness; frequent pulse; frequent urination; dyspepsia, with attacks of nausea and vomiting; tendency to inflammation of the heart-case, pleura, peritoneum, and the membranes of the brain, and also to inflammation of the retina, causing blindness; general dropsy; symptoms of uremic poison and convulsions; coma, drowsiness, and frequently headache; albumin in the urine, as shown by coagulation after adding nitric acid, and heating; cloudy sediment in the urine, consisting of casts.

Causes.—This disease is sometimes the result of acute inflammation of the kidneys. It most often occurs, however, in consequence of dissipated habits, the use of liquors, and severe and prolonged exposure to wet and cold. It may also result from excessive use of fats, gluttony, and sedentary habits. Chronic dyspepsia is unquestionably a prolific cause of Bright's disease. Fish and oysters as well as other meats must be forbidden. An aseptic diet (see Appendix) is essential. After death, the kidney is found to be very large, pale, and soft.

Treatment.—The patient must abstain from the use of butter, lard, fat meats, all kinds of fat foods, salt, sugar, and all sweet and starchy substances. The use of meat should be very limited indeed. Alcoholic liquors, tea, coffee, and tobacco must be wholly interdicted. Eggs may be used in moderation.

For relief of the dropsical symptoms, vapor baths, packs, a bandage about the abdomen, the application of electricity to the abdominal walls, and other measures recommended for a similar condition in other diseases, should be thoroughly employed.

WAXY DEGENERATION OF THE KIDNEYS.

SYMPTOMS.—Gradually increasing loss of strength; lassitude; great thirst; unusual quantity of urine; albumen in the urine; cloudy sediment, which is composed of tube casts; urine very dark colored and yellowish brown; enlargement of the liver and spleen; dropsy of the abdomen or general dropsy; sometimes watery diarrhea; symptoms of uremic poisoning.

This disease is very similar in its course to the preceding. It occurs most often in persons who have long suffered from syphilis, consumption, or a prolonged discharge, as from chronic abscess or bone disease, which may be considered as the chief cause of this affection.

Treatment.—The treatment is the same as for fatty degeneration.

CANCER AND CONSUMPTION OF THE KIDNEY.

These are rare diseases, and generally occur in connection with the same diseases of other parts. No special treatment is indicated, in consequence of the incurable character of these maladies.

MOVABLE AND FLOATING KIDNEY.

SYMPTOMS.— Movable tumor of the size and shape of the kidney, usually felt below the ribs on the right side; palpitation; pain in region of kidney; nervous headache; pain in the back.

Mobility of at least one kidney, usually the right, is present in more than one-third of all women suffering from pelvic disease who have worn the ordinary conventional dress, which includes most civilized women in the United States. The terms "movable" and "floating" kidney indicate simply different degrees of mobility. When the kidney is movable to such a degree that it falls as low as the umbilicus, it is said to be floating. When the mobility is less than this, the case is one of movable kidney. Palpitation of the heart or aorta, nervous headache, pain in the region of the kidney, and a dragging sensation across the abdomen, are common symptoms.

Treatment.—The above symptoms are in some cases relieved by the application of the Natural Abdominal Supporter (see Appendix), but this is, of course, merely palliative, and other curative measures must be employed. These consist,—

1. Of the application of electricity, especially the slowly alternating sinusoidal current as a gymnastic measure for the abdominal muscles.

2. Massage for replacement of the prolapsed viscera.
3. Appropriate exercises and manual Swedish movements.

These measures are so efficient in some cases of movable kidney that the organ can be made to return to its normal place and remain there ; but in some cases, especially those in which pain accompanies the prolapse of the organ, an operation, whereby the organ is restored to its normal place and made to remain in position by suturing with silkworm gut sutures, is essential. The operation is not a dangerous one, and often affords an astonishing amount of relief from pain.

ADDISON'S DISEASE—BRONZE SKIN.

SYMPTOMS.—Gradual darkening of the skin to bronze color, sometimes green or black ; most intense on exposed parts ; the roots of the nails and whites of the eyes remain uncolored ; black spots on lips and mouth ; great and increasing debility, and great depression ; pain in the back and at the pit of the stomach ; dyspepsia and vomiting ; diarrhea ; convulsions ; rapid pulse, but no fever.

This is a very peculiar disease, and is named after the man who first described it. The symptoms which characterize the disease are supposed to be due to chronic inflammation and degeneration of the supra-renal capsules, and disease of the sympathetic nervous system.

Treatment.—The only treatment which is of any value whatever is the employment of such measures as will improve the patient's general nutrition and enable him to tolerate the disease as long as possible, recovery rarely, if ever, taking place.

PYELITIS—INFLAMMATION OF THE PELVIS OF THE KIDNEY.

SYMPTOMS.—Chills ; fever ; pain in region of the kidney, with tenderness ; vomiting ; frequent and painful desire to pass urine ; excessive quantity of urine, which always contains pus and blood ; urine cloudy when passed ; pain increased by jolting of the body.

This disease cannot always be detected during life. It is often very obscure. Sometimes death occurs by perforation of the pelvis, the threatening of which is indicated by sharp pain in the back, pain in drawing up the limbs, and repeated chills.

Causes.—The most common cause is gravel. Other causes are the use of irritating diuretics, such as cubebs, copaiba, turpentine. It may also arise from extension of inflammation of the bladder or urethra to the kidney.

Treatment.—Apply cold compresses over the small of the back continuously, changing for fomentations, for fifteen minutes at a time, once in two or three hours. Fomentations may be applied longer if necessary to relieve the pain. When there is much pain, the prolonged warm full bath is the best remedy that can be employed. Kumyzoon, granose, an aseptic diet (see Appendix), the daily use of the large enema, copious water drinking, and general hygienic measures are of the greatest value in the treatment of this condition. In some cases a surgical operation is required.

GRAVEL IN THE KIDNEY—RENAL COLIC.

SYMPTOMS.—Small concretions and brick dust sediment passed in the urine; a sharp pain in the kidney, coming on after severe jolting, and acute pain darting from the kidney to the bladder and down the thigh; great desire to pass urine, efforts ineffectual; vomiting; sudden cessation of pain after having lasted from two to thirty minutes, or longer.

This disease occurs most often in adults, but not infrequently in children. It is an exceedingly painful affection, and may easily be mistaken for ordinary colic or the passage of gall-stones. The causes are the same as those which produce stone in the bladder. They are not fully understood at present.

Treatment.—Hot baths, fomentations over the kidney and following the course of the pain, and large draughts of hot water, are the most useful measures of treatment. In some cases of urinary calculi, an operation upon the kidney is required. In one case on which we operated, we found a calculus larger than an almond. It was so imbedded in the kidney that it never could have passed out of it, even if it had not been many times too large to be admitted into the ureter. Mobility or prolapse of the kidney is a cause of this condition.

PARASITES OF THE KIDNEYS.

The kidney is subject to parasitic affections as well as other parts, although less liable to be thus affected than the liver. The most common parasite of the kidney is the echinococcus. It is the undeveloped embryo of the tapeworm. The sac in which the parasite is contained frequently attains the size of a child's head. Another parasite of the kidney is the *strongylus gigas*, a worm which somewhat resembles the round worm found in the intestines. It grows from six inches to three feet long.

CATARRH OF THE BLADDER—CYSTITIS.

SYMPTOMS.—ACUTE : *Chilliness; pain and tenderness in the region of the bladder, extending to the perineum, and down the limbs; burning pain in the urethra; frequent scanty urination; either slight or high fever, or none at all; nausea; urine clouded with pus, stringy mucus and blood; clammy sweats.*

CHRONIC : *Symptoms sometimes slight. Walls of bladder tender; frequent urination; scanty urine, containing pus, and sometimes blood and viscid, ropy mucus; thickening of the walls of the bladder; ulceration, dribbling of urine, dilatation or contraction of the bladder; loss of appetite; derangement of the digestion; debility.*

This is a disease which, while not fatal, often renders a person subject to it very wretched for many years. When long continued, the mucous membrane of the bladder becomes roughened, fissured, often ulcerated, and in some cases almost entirely destroyed.

Causes.—Long retention of urine; decomposition of urine in the bladder when retained by temporary paralysis; use of cantharides, balsam of copaiba, and other irritating drugs; stricture of the urethra; enlargement of the prostate gland; irritation from stone and gravel; careless use of the catheter; especially use of a dirty catheter, causing decomposition of urine; exposure to cold; gonorrheal inflammation of the urethra, extending to the bladder; in females, pelvic inflammation.

Treatment.—Acute catarrh of the bladder generally recovers of itself in a short time, the patient having good care and proper nursing, and avoiding the causes by which the disease was produced. When it occurs in consequence of exposure to cold, the best remedy is thorough sweating by means of warm packs, or the full bath followed by dry packs. Thorough fomentations to the bowels and the use of large warm enemas in men, and prolonged hot vaginal douches in women, are also very essential measures of treatment. The patient should drink large quantities of water, and should abstain from the use of salt, spices, condiments, and should eat little meat. The latter suggestions also apply to chronic catarrh of the bladder.

Fomentations and frequent warm baths to induce vigorous action of the skin are also useful in chronic cystitis. When there is much pus and blood, it is generally necessary to wash out the bladder thoroughly with tepid water, containing a dram of salt or boric acid or of fluid extract of golden seal to the pint of soft water. When the bladder is dilated, the urine should be drawn with a good catheter two or three times a day, and the bladder should be well washed out

with a weak solution of carbolic acid. Four or five drops of carbolic acid to the ounce of water or bran tea is about the right proportion. In case of dilatation of the bladder, the patient should learn to use the catheter himself, so that in case the services of a physician cannot be readily secured, he may not be left to suffer. In severe cases the self-retaining catheter must be used for months, with daily washing of the bladder. When the bladder is contracted, the patient should retain the urine as long as possible, so as to dilate the contracted organ.

HEMORRHAGE OF THE BLADDER.

SYMPTOMS.—Bloody urine; many clots of considerable size.

Hemorrhage from the bladder is sometimes difficult to distinguish from hemorrhage from the kidneys. When it occurs at intervals, it may generally be distinguished, however, by the presence of pus and mucus in the urine during the intervals, which indicates chronic catarrh of the bladder, and also by the greater abundance of clots.

Causes.—Hemorrhage of the bladder may arise from ulceration of the bladder, from injury, or from the irritation of stone in the bladder. It also frequently occurs in cases of acute or chronic cystitis, and sometimes from vascular tumors which grow from the diseased mucous membrane of the organ.

Treatment.—The patient should be kept quiet in bed. Apply cold over the bladder, and heat to the extremities. In severe cases, it may be an advantage to tie a bandage tightly around one or both limbs, so as to retain a portion of the blood in the limbs, and thus encourage spontaneous checking of the hemorrhage. Elevate the hips.

Frequently recurring hemorrhage from the bladder often indicates malignant disease. In every case a skillful surgeon should be consulted and an examination of the bladder made. In one case which had long been treated without success, we found, by the aid of a cystoscope, a large polypus tumor, which we successfully removed, to the great satisfaction of the patient.

INCONTINENCE OF URINE—ENURESIS.

This affection is often a troublesome one, unfitting the patients for their accustomed avocations, on account of the necessity of relieving the bladder so frequently, in some cases every fifteen or twenty minutes. We have had patients who declared that they had to get up as often as twenty times during the night to relieve the bladder. There are two forms

of this disease. In the variety just described, the loss of power to retain the urine more than a short time is due to the sensitiveness in the bladder, which, in some cases, is the result of chronic inflammation; in others, of chronic inflammation, or enlargement, of the prostate gland. Another variety of the disease is that which gives rise to wetting the bed at night, which seems to be due to the opposite condition of the bladder, or diminished sensibility, so that the urine passes away without waking the patient. This form is most common in young children, rarely continuing after the age of twenty years.

Causes.—Some of the causes of the first form of the disease have just been mentioned. Constant dribbling of urine also sometimes results from dilatation of the bladder and partial paralysis of its walls. The patient passes water frequently through the day, and never empties the bladder fully, so that it continues to overflow. The nocturnal incontinence of urine arises from causes not fully understood. It is not generally, as many people suppose, a simple habit. It is sometimes occasioned by sleeping on the back.

Treatment.— For the first form of the disease, cold sitz baths, cold douches over the bladder and feet daily, and daily washings by tepid water, are essential. If the urine is strongly acid, the patient should abstain from the use of meat. For "wetting the bed at night," a great variety of remedies have been tried, most of which are of no value whatever. The most effective plan which can be pursued, is to restrain the patient from drinking for three or four hours before retiring. An eminent physician has also suggested that the use of meat by children encourages the habit. Whipping, scolding, and frightening children, unless there is good evidence that the child is lazy or vicious, will do no good; in fact, these measures are likely to do harm by exciting a nervous condition of the system which will encourage the very thing which is to be corrected. Wearing a wet bandage about the lower part of the bowels at night is a very useful measure. To prevent the patient from sleeping upon the back, a good remedy is to tie a knot in a towel and place it about the body in such a way that the knot will come at the center of the back. In cases in which the patient is old enough, and sufficiently intelligent to appreciate moral influence, he should be encouraged, and should be given some simple prescription in which he should be taught to have perfect confidence as a certain cure, since faith will do much toward effecting a cure when other remedies are of no avail.

SPASM OF THE BLADDER.

SYMPTOMS.—Incontinence; retention of urine; desire to pass urine, but inability to do so; violent pain, with intervals of complete relief; spasm in the rectum; in some cases, general convulsions.

Causes.—This disease is often a very troublesome one. It may arise from disease of the brain and nervous system, or, as is generally the case, it may be the reflex result of irritation of the womb or of the rectum, as from piles or fissure. It also occurs very frequently in hysterical and nervous women from pure nervousness.

Treatment.—Removal of the cause, if possible, by cure of the disease upon which the difficulty depends. The best palliative measures are warm baths, hot enemas in men, and prolonged vaginal douches in females. Passing the catheter will often relieve the spasm at once.

PARALYSIS OF THE BLADDER.

SYMPTOMS.—Retention of urine; when bladder is greatly distended, dribbling; urine bad smelling and loaded with mucus; often severe pain at neck of bladder.

Causes.—The most frequent causes are general paralysis; paralysis of the lower part of the body; over-distention of the organ from stricture, or other obstruction to urination; sexual excesses.

Treatment.—When the paralysis is complete, the bladder must be relieved by means of the catheter two or three times a day. The best curative remedies are cool sitz baths, cool compresses over the bowels, cool enemas in males, and tepid, gradually cooled douches in women; daily injection of the bladder with warm water gradually cooled down to 65° or 70°; application of electricity to the bladder, both through the abdominal walls and by means of the metallic sound, two or three times a week; cold douche to feet.

IRRITABILITY OF THE BLADDER.

SYMPTOMS.—Straining after urination, with desire to pass water when the bladder is empty; frequent urination; dribbling urine; smarting in urination; pain in back and at the fork of the thighs in males; relief of the symptoms at night.

This is a very common difficulty. It frequently exists in consequence of slight catarrh of the bladder which has not been discovered, and continues after recovery from chronic catarrh of the bladder.

Causes.—The chief causes are neglect to relieve the bladder; acidity of urine from the excessive use of meat, use of alcoholic liquors and

tobacco; self-abuse; prolonged sexual excitement from lewd thoughts; excessive sexual indulgence.

Treatment.—Avoidance of the causes; a nutritious diet of fruits and grains, and total abstinence from tea, coffee, tobacco, and alcoholic liquors, and the use of meat in very small quantities. Fried food, butter, ginger, mustard, pepper-sauce, and all other irritating condiments should be wholly discarded. As the patient suffering from this disease is often very gloomy and despondent, he should be supplied with cheerful surroundings. By way of treatment, the warm sitz bath and the use of fomentations to the lower part of the spine, are in very severe cases to be recommended. The patient should also carefully avoid straining after passing urine. Passage of the sound is also useful. We have employed, with excellent success in some cases, a double sound, so arranged as to allow the circulation of a current of water through it while in use. We regard this as a very excellent measure of treatment. The bladder douche is also useful.

GRAVEL.

SYMPTOMS.—Irritation of the bladder; white or red sediment passed with the urine.

Causes.—A red sediment occurs in persons whose urine is very acid. It is most frequent in persons suffering with gout and rheumatism, and often arises from the excessive use of meat. White deposit, generally composed of phosphates, is most common in persons suffering with chronic dyspepsia, neuralgia, and various nervous disorders; also, is often produced by overstudy, loss of sleep, overwork, dissipation, etc., etc.

Unnecessary alarm is frequently excited by the discovery of whitish sediment in the urine, especially in persons who have been addicted to self-abuse, which is also a common cause of this affection, it being mistaken by these persons for seminal fluid. A microscopic examination is necessary in these cases to determine whether the patient's fears are groundless or not.

Treatment.—The treatment consists in the avoidance of flesh diet, alcoholic liquors, tea, coffee, and tobacco; an abundant use of fruit and grains when the person is suffering with the red, or uric acid gravel. Fomentations over the liver, and the wet girdle worn about the body at night, together with a wet-sheet pack or hot air or vapor bath once or twice a week are excellent measures of treatment. If there is much irritability of the bladder, a cool sitz bath should be taken daily. For white deposit, the best remedies are such tonic measures as will improve

the patient's condition. Special attention should be given to improving the digestion. Abundant out-of-door exercise, sun baths, and frequent inunctions, are among the chief remedies indicated in this difficulty.

STONE IN THE BLADDER.

The causes of this affection are similar to those of the preceding.

Gravel probably originate in the kidneys, and finding their way to the bladder through the ureter, there become gradually enlarged until calculi are formed. More can be done for the relief of stone in the bladder by regulating the diet than by the use of any of the so-called "solvents" for calculi, which are of little, if any, value. Large calculi generally require a surgical operation for their removal. The cutting operation so long practiced is now being, in a considerable degree, superseded by the new operation of crushing, which can be performed by a skillful surgeon much more rapidly and safely than the old operation of lithotomy.

TUMORS OF THE BLADDER.

Tumors of various sorts, principally vascular or villous in character, occasionally form in the bladder, in consequence of long-continued catarrh of its mucous membrane; warty excrescences are also formed in profusion over the surface of the bladder. Cancer occasionally affects this organ as well as nearly every other in the body.

The treatment of these affections also pertains to the domain of surgery, and need not be considered further here, especially as they are very rare; and no treatment can be applied to them on account of the difficulty in reaching the seat of the disease.

The Cystoscope.— This is a modern invention of great value, by means of which it is possible to inspect with the eye the inside of the bladder with almost the same facility with which the skin may be examined. By means of this instrument, not only ulcers and tumors of the bladder may be discovered, but inflammatory patches may be made out, and the necessary measures adopted for their removal.

DISEASES OF THE LOCOMOTIVE ORGANS.

ACUTE RHEUMATISM.

***SYMPTOMS.**—Slight chilliness for two or three days, followed by fever, or fever from the first; pain in one or more joints, most frequently in the knee, ankle, wrist, or shoulder, which increases rapidly and becomes very severe; great tenderness of the affected joints; pain greatly increased by motion; joint swollen; pulse ninety to one hundred a minute, sometimes more rapid; frequent respiration; sour saliva and perspiration; considerable thirst; scanty and high-colored urine, usually with reddish sediment; tongue coated.*

Acute rheumatism is a very common disease. It is rarely immediately fatal, but very often leaves the patient with difficulties which, sooner or later, terminate his life. This occurs whenever the heart becomes affected by the disease, which not infrequently happens. This does not occur by a metastasis or change of the seat of the malady from the joints to the heart, as is often supposed, but by an extension of the disease to the lining membrane of the heart. In consequence of inflammation, the valves of the heart become thickened and contracted so that valvular organic disease of the heart is the result. Rheumatism is the most common cause of this form of heart disease. The extension of the disease to the heart is indicated by the occurrence of acute pain in the left side, in the region of the nipple, disturbance of the pulse, increase of fever, and increased frequency of respiration, in fact, all the symptoms elsewhere described as occurring in endocarditis. Only one, or all the joints in the body, may participate in the inflammation. The joints are generally affected symmetrically; that is, the ankles, wrists, knees, elbows, or shoulders, will be affected on both sides at the same time. When this is not the case, analogous joints upon the same side, are likely to be affected, as the ankle and wrist, the knee and elbow, the hip and shoulder, etc. Sometimes the disease appears to be very fickle, changing constantly from one joint to another without any apparent cause, the change taking place within a few hours.

By a careful investigation of the subject nearly forty years ago, our instructor in the practice of medicine and physical diagnosis, Dr. Austin Flint, of Bellevue hospital, New York, showed that rheumatism is a self-limited disease; that is, one which will recover of itself, without

any treatment whatever, and in from two to eight weeks, the average duration of the disease being about four weeks. Dr. Henry Sutton, of Guy's hospital, England, in his investigations found the average duration, in forty-one cases, two weeks. In two subsequent series of cases, the duration was nine to ten days.

Causes.—The causes of rheumatism are not thoroughly understood, but it is generally believed that exposure to cold and wet are the most common exciting causes, while free living, especially the large use of meat, and sedentary habits,—conditions which favor the production of an acid condition of the blood, particularly the accumulation of uric acid,—have much to do with producing a predisposition to this malady. Dr. Murchison holds that inactivity of the liver is a predisposing cause of rheumatism. A tendency to the disease is undoubtedly inherited in many cases. Rheumatism seems to be very closely allied to gout, a disease from which it cannot always be distinguished. Indeed, some very eminent observers hold that rheumatism and gout are due to the same cause,—uric acid. Rheumatism is doubtless, in some cases, due to infection.

Treatment.— The preventive treatment of rheumatism consists in thoroughly clothing the body, wearing flannel next to the skin, protection from the exposure to cold and damp, especially sudden checking of the perspiration, and avoidance of too free use of animal food. The excessive use of salt and of the various condiments, together with the use of alcoholic liquors and tobacco, produce an undoubted tendency to this disease. As soon as possible after the attack begins, the patient should be placed in a hot blanket pack, in which he should be kept for several hours. As a general rule, the longer the pack is continued, the better the effect. The pack should be continued two to four hours at least, and may be repeated two or three times within the twenty-four hours with advantage. In the Mt. Sinai hospital, of New York, this plan of treatment has been adopted almost to the exclusion of other methods, and with marked benefit. In some cases, the patients were left in the pack all night. We have employed this plan of treating rheumatism for a number of years with most excellent success, patients having all made good recoveries without complications. Hot air, vapor, Turkish, and Russian baths are also valuable, as well as the hot pack, but less serviceable on account of the pain occasioned by moving the patient in the administration of the bath. Hot fomentations applied over the affected joints give great relief.

The joints should be kept constantly enveloped in warm applications. Moist heat may sometimes be exchanged for dry heat, in the form of bags filled with salt, sand, or corn-meal, or some similar substance, as hot as can be borne. Hot-water bags constitute the best method of applying dry heat in these cases. The patient should be allowed an abundance of drink. Lemonade, with a very little sugar, is one of the best drinks, as the juice of the lemon seems to have some influence upon the disease, in some cases. The sour perspiration should be frequently removed from the skin by rubbing with dry flannels. Warm sponge baths often add to the patient's comfort. An eminent French physician has recommended the application of cold water to the sound part of the body, the water being injected into the tissues near the joint corresponding to the affected joint, by means of the hypodermic syringe. He claims to have obtained almost marvelous results from this mode of treatment. (See page 1066.) When the fever rises very high, it is, in some cases, necessary to administer a prolonged cool bath. The patient should be put into a bath about the temperature of the body, the temperature of the water being gradually lowered to seventy-five or seventy degrees. The bath should not be prolonged sufficiently to produce marked chilliness on the part of the patient. We have never resorted to this measure, though it is highly recommended by some eminent authors. It is a somewhat severe one, and is attended by slight danger of occasioning rheumatism of the heart, and when employed should be used with very great care on this account. The employment of tepid sponge baths, repeated every hour or two, or more frequently, if necessary, is a safer means in these cases. When hot fomentations seem to increase the pain in the joints, cool or cold applications may be employed.

The diet of the patient during the attack should consist wholly of simple preparations of fruits and grains. Meat, beef-tea, and all other animal food, excepting milk, should be wholly avoided. The use of meat after convalescence is begun, is a frequent cause of relapse, hence flesh should not be eaten for some weeks after recovery.

If symptoms of inflammation of the heart arise, the patient should be kept upon a very low diet, or should take little or no food for a day or two. Hot fomentations and poultices should be constantly applied to the chest, covering the whole left side. The patient should have an abundance of fresh air, but should not be exposed to drafts.

The number and variety of drugs which have been employed for

rheumatism are almost endless. Scarcely a month passes which does not bring to light some new remedy, which is pronounced to be a panacea for this disease. The unreliable character of these remedies is shown, however, by their great number and variety, which is sufficient evidence that they do not accomplish what is claimed for them.

Prof. Niemeyer expresses very little confidence in medication of any sort as a means of shortening the duration of this disease, and the investigations of Dr. Flint and Dr. Sutton, already referred to, show that good nursing, without any medication whatever, secures as speedy recovery as the use of any known remedies. If any remedy at all is to be taken, ordinary baking-powder, taken in doses of half a thimbleful, dissolved in water, once in three or four hours, answers as good a purpose as anything which can be used. It is well to allow the patient to take lemon juice or eat lemons as freely as he desires. Several may be eaten every day with advantage. Salicylic acid, which has been recently recommended for rheumatism, does not sustain the reputation given to it, and sometimes serious symptoms have been produced by its free use. In severe cases of rheumatism, a physician should be called when one can be obtained.

Sub-acute Rheumatism is a form of the disease in which the symptoms are less acute, but continue a longer time, the patient being subject to frequent relapses. It often follows the acute form of the disease. The treatment is essentially the same as that described for acute rheumatism.

CHRONIC RHEUMATISM.

SYMPTOMS.—Pain in the joints; slight tenderness on pressure; more or less swelling of the joints; either one or several joints may be affected; slight fever or none at all; pain increased at night, and by bad weather.

Chronic rheumatism, sometimes beginning with the acute form and sometimes insidiously, generally runs an independent course. It often produces more or less deformity, when long continued, from stiffness of the joints. In many cases the patient suffers with flatulent dyspepsia, and other forms of indigestion. The disease is very chronic in character, often continuing many years. Rheumatism is a general malady, in which every organ and function of the body is impaired.

Treatment.—Pain and stiffness of the joints is best relieved by hot-water bags, hot fomentations, and friction. The prolonged hot spray and hot pour we have also used to very great advantage. In his article

on this disease, Prof. Niemeyer remarks that the douche applied to the affected part is a much more effective derivative than the hot iron, which is often recommended, together with plasters and other irritants. When the pain in the joint is very severe, and the inflammation great, some physicians recommend the employment of a freezing mixture of snow or pounded ice and salt. The joint should be protected by thin muslin, and surrounded by the mixture. The application should not be continued more than five minutes, but may be repeated. It should not be employed more than twice a day. It almost always gives immediate relief.

The various liniments which have been recommended are generally effective only by means of the rubbing by which they are applied. This view we have often confirmed by our own experience. The pains at night are generally relieved by wrapping the affected joints in moist cotton covered with oiled silk and a mass of dry cotton. We have often recommended patients, in whom the disease was chiefly confined to the hands, to wear upon the hands at night large cloth mittens filled with oatmeal or corn-meal mush and tied about the wrist. We have seen excellent results from this simple plan of treatment. It acts upon the same principle as the warm packing of the joints, a remedy which has in our hands proved more effective than any other in relieving the pain and tenderness, and removing stiffness. The general condition of the system, on which the disease of the joints depends, will be best relieved by the employment of the wet-sheet pack, the vapor, hot air, Turkish, or Russian baths, and other eliminative measures. Some one of these modes of treatment may be employed daily to advantage, when the patient is strong enough to bear severe treatment, and in some cases will need to be continued for months. We have frequently been taught the importance of persevering, even in apparently hopeless cases, by seeing patients recover under this treatment, after the employment of a great variety of remedies for years without any apparent benefit, indeed, without even checking the progress of the disease. The great reputation enjoyed by some mineral springs in the treatment of rheumatism, particularly by the hot springs of Arkansas and other thermal springs, is due to the active elimination which is induced by the hot baths. We have, however, successfully treated cases which have remained under treatment at these celebrated resorts for months without benefit, and had almost totally despaired of recovery.

We have found, in some cases, great advantage from the use of local

applications of electricity to the affected joints while the patient was in a warm bath, as in a Turkish, hot-air, or vapor bath ; and a combination of electricity, particularly of faradic electricity, with the warm water bath, is also a very effective means of relieving pain in the joints. The application of a strong galvanic current to the affected joints, daily, or every other day, has proved very successful in some cases. We consider inunction a very important adjunct to the treatment, especially in cold weather, as it in some degree protects the patient from the results of exposure to alternations of temperature. Such exposure should be avoided, however, as much as possible, as it is very important that the temperature to which the body is subjected should be kept as uniform as possible. The body should be clothed in flannel, and the affected joints should be protected with extra covering. The tendency to stiffness of the joints should be counteracted by daily manipulations to as great an extent as possible without exciting too great increase of pain. The patient should resist as much as possible the tendency to bend up the limbs and joints which are affected. In case the knee joints are affected, the tendency to stiffening in a flexed condition may be prevented by elevating the feet when sitting.

The diet of the patient should be nutritious, but as free as possible from meat and all highly nitrogenous food. Tea, coffee, tobacco, and alcoholic liquors and stimulating condiments should be carefully avoided. Salt should be used as little as possible. Bouchard has recently shown that dilatation of the stomach, and consequently development of poisons in the stomach from decay of the too long retained food, is the principal cause of chronic rheumatism. An aseptic dietary is necessary.

DEFORMING RHEUMATISM, OR RHEUMATIC GOUT.

SYMPTOMS.—Pain in joints, usually slight, sometimes severe ; pain increased by pressure and by motion of the joint ; motion of the joint accompanied by slight crackling deformity of joints ; fingers drawn toward the little finger side of the hand.

This disease in some respects resembles rheumatism, while in others it is more like gout. It is not always accompanied by the fever and inflammation usually present in rheumatism. It differs from gout in that it affects the large as well as the smaller joints.

Gout is generally confined to the fingers and toes. Rheumatic gout may affect every joint in the body, and in some cases produces the most surprising deformity. The peculiar deformity of the hand shown

in Fig. 333 is characteristic of this disease. We have met a number of cases in which all the large joints were dislocated.

Galvanism and massage are the most important measures of treatment. Hot baths should be avoided. Only such measures should be employed as will build up the general health. Exposure to cold and exhaustion must especially be avoided. The same diet recommended for chronic rheumatism is applicable to this disease. The disease may generally be arrested and much improvement secured, although a radical cure is, of course, impossible.

Fig. 333.

MUSCULAR RHEUMATISM.

SYMPTOMS.—Dull pain in the affected part, resembling that from a bruise ; pain increased by motion, often of a cramp-like character, and sometimes excruciating ; tenderness on slight pressure ; pain relieved by firm pressure.

It is probable that this disease is often neuralgic in character, though it is likely that in many cases it is a manifestation in the muscles of the same disease which more often shows itself in the joints. It may affect any part of the muscular system, as the muscle of the scalp, muscles of the face and jaw, muscles of the eye and all other external as well as internal muscles. What is termed pleurisy of the diaphragm is probably in the majority of cases really rheumatism or neuralgia of that muscle. The most common forms of muscular rheumatism are pleurodynia, in which the disease affects the muscles of the chest, and lumbago, in which it is confined to the muscles of the back. Pleurodynia is often mistaken for pleurisy and intercostal neuralgia, as it occasions pain upon drawing a long breath as well as from coughing or sneezing. Persons suffering with it often imagine themselves to have some serious lung disease. When it affects the back, producing "crick in the back," the patient can neither bend over nor straighten up, but is obliged to hold the trunk in a stooping position.

The causes of muscular rheumatism are the same as those of other forms of rheumatism. Patients suffering with it generally have dark colored urine which contains large quantities of urates, or uric acid, indicating an inactive condition of the liver. It most frequently occurs in persons who make free use of meat, condiments, salt, and

alcoholic drinks. It is, perhaps, frequently excited by taking cold through exposure to drafts.

The pains of muscular rheumatism are undoubtedly simulated, in many cases, by infection of the muscles with trichinæ. As the capsules in which the parasites are inclosed become chalky from age, they are sources of irritation, as foreign bodies.

Treatment.—The best treatment for muscular rheumatism is the employment of moist heat, the application of hot bags, gentle rubbing, rest, and improvement of the general health. Galvanism, and, in most cases, faradization, give very prompt relief. The same general directions, with regard to treatment, diet, clothing, etc., as have been given for acute and chronic rheumatism, should be followed in this affection as well.

It is especially important that the whole body should be clothed in flannel. The pain in the back may often be greatly relieved by wearing a tight flannel bandage about the body. When severe, a warm poultice may be worn over the seat of the pain. The old-fashioned pitch-plaster, which is so often used for these cases, undoubtedly does some good by retaining the natural warmth of the part and giving the muscles rest.

GOUT.

SYMPTOMS.—Acute pain in great toe, heel, or instep, occurring suddenly; chill, followed by heat; tenderness and swelling of the affected part; fever and restlessness; irritability of temper; constipation; coated tongue; urine dark, with heavy deposit; in chronic cases, enlargement about the joints.

Causes.—The chief causes of gout are the excessive use of meat, the use of stimulating condiments, beer, wine, alcoholic liquors, and high living in general.

Dr. Joseph Drew of Breckingham, England, in an article in the *British Medical Journal* some years ago, called attention to the fact that the use of salt is a frequent cause of gout. He had suffered from the disease for over twenty years, until his joints became greatly enlarged. By discontinuing the use of alcoholic beverages, he was very much improved, but the enlargement and stiffness of the joints still remained. It occurred to him that, as the disease was greatly aggravated by the use of cakes, biscuit, or anything which contained soda, as his experience had abundantly proven, it was quite possible that chloride of sodium, or common salt, might also be a cause of aggravation of

the difficulty. The remainder of the account we will give in his own words.

"The idea once started, it was, of course, immediately carried into practice, and chloride of sodium was placed in the *index expurgatorius.* Salt was omitted as an article of diet, not only as a condiment, but avoided in salted meat or any other accepted comestible. The result in four or five weeks has been astonishing. Most of the stiffness has passed away. Finger rings that had been laid aside can be worn, and the phalangeal finger bones have almost returned to their primitive size and shape."

Dr. Drew further remarks that on every occasion on which he had taken any article of food containing soda in any form, he had suffered a relapse, or an increase of his pain and symptoms, even when used in small quantity, and when he was entirely unaware of the digression. Recent researches show that salt and soda impair digestion.

Treatment.—In a majority of cases, the pain of gout is only a proper punishment for dietetic and other transgressions committed by the sufferer. Complete and permanent cure can only be effected by the adoption of a vegetable diet, and the disuse of all forms of alcoholic beverages. All the habits of the patient must be regulated in accordance with the laws of hygiene. Excess in the quantity as well as in the quality of food should be avoided. He should practice free water-drinking, taking anywhere from four to ten glasses of pure water per day. Abundant exercise in the open air should be daily taken. The affected parts should be carefully protected from the cold. The patient should take daily fomentations over the region of the liver and kidneys, as well as over the affected parts. Either dry or moist heat may be used for the relief of local pain.

In bad cases it may be necessary to employ heat continually. Hot-air, vapor, Turkish, and Russian baths are excellent means of eliminating from the system the waste and excrementitious material which lies at the foundation of this disease. A wet-sheet pack is equally valuable for the same purpose. Wearing of a moist abdominal bandage night and day for several weeks is also a useful measure. During the attack, the affected limb should be elevated above the level of the body, carefully covered with cotton or wool, and the patient should abstain from food almost entirely for two or three days, taking only a little gruel or toast once or twice a day. A celebrated French author recommends the drinking of six ounces of hot water every fif-

teen minutes during the attack. The active sweating produced by this measure will certainly be conducive to recovery.

SOFTENING OF THE BONES—MOLLITIES OSSIUM —OSTEO-MALACIA.

SYMPTOMS.—Boring, tearing pain in the bones, relieved by quiet, increased by motion; pain at first thought to be rheumatic; slight fever; much sediment in urine; gait tottering and uncertain; distortion of body and limbs; general health often not impaired for some time.

This is a disease in which the bones undergo a process of softening by the removal of the phosphates and various other earthy matters which give them solidity. Fatty degeneration of the bones takes place, so that they become weak and fragile. The distortion of the body sometimes becomes very great, affecting the whole skeleton. This disease most frequently occurs in women, beginning a short time after confinement, especially in cases in which there has been injury to the pelvic bones, which constitutes a starting point of the disease.

Fig. 334.—Healthy Muscular Fibres. **Fig. 335.**—Fatty Muscular Fibres.

Treatment.—Fortunately, this disease is very rare, as it is incurable. The most that can be done is to prevent distortion of the body by proper support of the parts most likely to become deformed.

FATTY DEGENERATION OF THE MUSCLES.

This is a morbid process in which the proper muscular tissue is replaced by little particles of fat. The change in appearance is easily seen by reference to Figs. 334 and 335, in which are shown the healthy muscular fibres and fibres which have undergone fatty degeneration. It occurs in muscles which have long been paralyzed, being the result of their non-use. The occurrence of fatty degeneration in the muscles is one of the results to be guarded against in cases of paralysis. It may be prevented by the daily employment of massage and the use of electricity.

INFECTIOUS DISEASES.

Under this heading will be considered all diseases of a contagious character, together with those which arise from miasma. A contagious disease is one which is communicated by actual contact of an individual with palpable substances, originating in individuals suffering with the disease. Infectious diseases are those which are propagated by means of impalpable substances carried in the air. Nearly all contagious diseases are also infectious. In most infectious diseases, the morbid parts which give rise to the disease proceed from individuals suffering with contagious maladies. In some cases, however, as in the so-called malarial diseases, such a connection cannot be traced.

The Germ Theory of Disease.—The supposed nature of germs has already been considered. (See page 548.) In the case of quite a number of the diseases included under this heading, it may be claimed that absolute proof of the existence of microscopical organisms as specific causes of the affections referred to has been obtained through extensive and searching investigations which have been made respecting this subject. In the case of several, while proof is not absolute, the evidence is such as to leave little room for doubt. Recent investigations of the nature and cause of malarial poisoning seem to have shown beyond reasonable doubt that this class of affections depend upon certain low animal organisms which are produced in great abundance under conditions known to be favorable to the development of malarial diseases.

Infectious diseases are divided into two classes, acute and chronic. We shall consider both classes together without reference to any particular classification.

FEVER.

***SYMPTOMS.**— Usually begins with chill; dry, hot skin; full, quick pulse; elevation of temperature; thirst; coated tongue: headache; little or no appetite; nausea; pain in back and limbs.*

The above are the symptoms characteristic of fever, a condition which is present in nearly all the diseases included in this section. In the various febrile diseases, numerous other symptoms arise in addition to those which pertain to fever itself, varying according to the particu-

lar affection or the local complications which may arise. Fever is generally understood to be a disease of the blood. In the majority of cases, its cause is the introduction into the system of poisonous or morbid elements of some sort. When the infection received into the system is of an animal or vegetable nature, reproduction may take place, occasioning a great increase in the quantity of the morbid element. This explains the fact that a certain period, varying from a few hours or days to several months, almost always elapses after the morbid elements are received into the system before the chief symptoms of the disease make their appearance. This is called the period of incubation.

Fig. 336. Fever Thermometer.

The Temperature.—The natural temperature of the body, when taken under the tongue or in the arm-pit, is 98½°. Only very slight variations occur in health. When the temperature rises to 100° or more, the pulse will almost invariably be found to be increased in frequency. The frequency of respiration will also be increased, and other symptoms of fever will generally be found. It may happen, however, that the increased temperature, as detected by the thermometer, will be the only febrile symptom which can be readily detected at the very beginning of febrile disease, since this is by far the most delicate and reliable means for determining the degree or intensity of febrile action. Fig. 336 shows one of the latest forms of fever thermometer which has been devised. Every family should possess a reliable instrument of this kind, as, by its aid, the first beginnings of disease may sometimes be detected. In using the thermometer, care is necessary to secure correct results. If the instrument be placed in the arm-pit, the arm should be drawn close to the body, with the fore-arm drawn across the chest, so as to cover the instrument as completely as possible. It should be retained in position eight or ten minutes. It is often more convenient to take the temperature in the mouth, the bulb of the thermometer being placed under the tongue, the lips of the patient being kept tightly closed for five or ten minutes. In young infants, the thermometer may be introduced into the rectum. In this location, the temperature is found to be about a degree higher than in the mouth or arm-pit. Before placing the thermometer in position, if it is a self-registering instrument, and no other should be employed, care should be taken to shake the

index down to 90° or 95°, reading from the upper end of the index, which consists of a short column of mercury detached from the main column.

A very accurate idea of the temperature of the body may generally be obtained by means of the hand, if proper precautions are taken to avoid error. In order to judge correctly of the temperature, the hand should be perfectly clean, smooth, and dry, and should be properly warmed before applying to the body; as, if the hand happens to be cold, the body may feel unnaturally hot, although of normal temperture. First, one or two fingers, and then the whole flat surface of the hand should be laid upon the body.

The variations of temperature from that of health differ in various febrile diseases, in some running very high, while in others only a very moderate degree of elevation is noticed. As a general rule, the temperature does not rise above 103° to 105°. A temperature over 107° is very likely to prove fatal, although cases have been known to recover in which the temperature has risen two or three degrees higher. In depression, the condition opposite that of fever, the temperature is lower than normal, sinking even as low as 95° or 94°, or even lower. A very low temperature is as grave a symptom as a very high one; but occurs much less frequently.

The general supposition that a chill is the opposite of fever, is an error. The thermometer shows that the temperature is elevated during a chill as well as during a fever. The temperature may not rise as high, but is considerably above the normal standard. In most of these cases, the thermometer is of course the only reliable means of determining the temperature, as the skin is, not infrequently, cold and the patient shivering, while the internal temperature of the body is much higher than in health.

Classification of Fevers.—We shall not here attempt to give a scientific and elaborate classification of the affections to which the term fevers is attached. Fevers in which the high temperature is continuous from the outset without any very great remission or interruption, are termed *continued* fevers. To this class belong febricula, typhoid and typhus fevers, erysipelas, and relapsing fever. *Periodical* fevers are those in which the disease is subject to regular periodical intermissions or remissions. Intermittent, remittent, typho-malaria, yellow fever, and a fever to which the term dengue is applied, belong to this class. Fevers in which the nervous system is very greatly dis-

turbed are said to be *ataxic.* Those which are very fatal are called *malignant. Putrid* fevers are those in which there is supposed to be tendency to putrefactive changes in the fluids of the body. The terms gastric and mucous fevers are sometimes applied to fevers in which the stomach and intestinal canal are particularly affected. The terms high and low, as applied to fevers, relate to the degree of temperature. A slow fever is one in which the intensity of the fever is not great, but the duration prolonged. Congestive fevers are those in which there is supposed to be a marked tendency to congestion of the internal organs.

General Treatment.—In a majority of the infectious diseases of which fever is a prominent symptom, the great danger to life is occasioned by the great increase of temperature. This is also the principal cause of the rapid loss of weight and strength by a patient suffering with fever. There is an unusually rapid destruction of the tissues of the body, while at the same time there is a loss of assimilative power, so that the wasted tissues are not readily replaced. The nervous system, and especially the heart, also suffers directly from the depressing influence of a high temperature. In consequence of this fact, the treatment of fevers comprises the most essential measures to be employed in the treatment of the whole class of diseases included in this section; and the directions given should, with few exceptions, be followed in all cases in which fever is a prominent symptom, other measures being employed as may be indicated by their special symptoms. As the high temperature is the greatest source of danger in fever, the greatest importance attaches to remedies which will have an influence to lower the temperature. Those which are most effective for this purpose may be briefly enumerated as follows: Sponging with cold, cool, or tepid water (page 638); the application of the cold compress to the abdomen, chest, or head, or to all at the same time (page 664); ice to the spine (page 667); wet-sheet pack (page 641); cool shower bath (page 649); affusion (page 648); cool or cold enemas (page 663); drinking ice-water, or swallowing bits of ice; the graduated full bath (page 645); the cool-air bath.

Any or all of these measures may be employed, according to the particular indications of each individual case. When the fever is slight, tepid and cool sponging, and the application of tepid compresses over the abdomen, are usually sufficient. When fever rises very high, as indicated by very full and rapid pulse, severe headache or delirium,

throbbing temples, and a temperature of 102° to 105° or upward, ice to the head and spine, cold compresses over the bowels, frequent cool sponging, and the use of the cool or cold enema once in two or four hours, are the remedies upon which we chiefly depend. By the combined use of these measures, the temperature can almost always be readily controlled. The cold enema is a very useful measure indeed, and is especially serviceable in cases in which the patient complains of chilliness upon being sponged with cold water.

We also value very highly as a means of reducing the temperature, the application of the ice compress to the spine and back. If the patient complains of chilliness, a bag of hot water may be placed at the pit of the stomach. The compress may be continued for from fifteen minutes to two or three hours, care being taken that the skin is not injured by the direct contact of the ice, or the patient annoyed by the cold water from the melting of the ice running down about the body. In extreme cases, the shower pack, or the graduated bath may be employed. We believe, however, that these measures can be dispensed with, even in the most severe cases, if the other measures mentioned, especially the cool enema, are thoroughly employed.

When the fever is high, the patient may be allowed to drink freely of cold water, as by this means an appreciable effect upon the temperature may often be obtained. If at any time, unpleasant sensations are produced in the stomach by taking too much cold or iced water, it may usually be quite promptly relieved by applying a hot fomentation over the stomach. When the patient complains of a bad taste in the mouth and a dislike for water, weak lemonade, slightly sweetened, may be used to very great advantage. Juices of various other fruits, as of apples, raspberries, currents, etc., may be used in the same way as lemon juice. In cases in which the stomach is very irritable and rejects drinks of all kinds, the thirst will often be relieved by giving the patient an enema, as a considerable quantity of fluid may be absorbed by the mucous membrane of the lower bowel. When given for this purpose, as when administered to reduce the temperature, quite a large quantity of water should be employed. It should be introduced very slowly and should be retained as long as possible, half an hour at least. When the disposition to expel the water cannot be readily controlled, a sponge or napkin should be held against the anus for some ten or fifteen minutes. The severe headache which most fever patients suffer, is best relieved by a continous application of cold to the head (pages 679, 680).

The diet of a fever patient should be very simple, consisting almost wholly of fluid food, as oatmeal gruel, graham gruel, milk, and, occasionally, chicken or mutton broth, or beef tea. Animal broths are not recommended, however, on account of their innutritious character. The same objection is valid against the use of beef tea, and especially against the various extracts of beef which are sold at the drug stores, which, as remarked by an eminent French physician, are simply solutions of ptomaines and cannot be considered as food. No meat nor solid food of any kind, with the exception of toast, should be allowed. Baked sweet apples, ripe grapes, oranges, and lemons are about the only fruits which may be safely employed under nearly all circumstances when the stomach does not reject food. When grapes are taken, the skins and seeds should be rejected. Vegetables should be discarded as deficient in nourishment, and hard of digestion. Rich sauces, preserves, pastries, and other delicacies should be strictly prohibited. These articles are not very difficult of digestion, but contain very little nourishment. Thin water gruels and fruit juices should constitute the diet in this disease. Milk often disagrees; it is only admissible in the form of kumyzoon (see Appendix) or buttermilk. Granola and gluten are also of great service. When milk cannot be taken alone, it may be combined with barley water or oatmeal gruel, in varying proportions to suit the wish of the patient. When necessary, add lime-water, one part to three or four of milk.

In cases in which the patient is too feeble to take nourishment, or is unconscious and refuses to swallow food when it is placed in the mouth, nutritive enemata should be employed. It is a mistake to suppose that a patient suffering from fever requires no nourishment at all until the appetite returns. The opposite extreme of excessive feeding should also be avoided. If the patient takes no nourishment at all, the depression and weakness resulting from the disease will be very much increased, and death may result from the great weakness occasioned by want of nourishment. Excessive feeding will increase the fever. We have observed cases in which the violence of fever was very greatly increased by the use of large quantities of stimulating food, as beef tea, egg-nog, brandy and milk, etc. The directions sometimes given to feed a patient every few minutes, or every half hour, is pernicious advice, unless the patient is so weak that only one or two teaspoonfuls of food can be taken at a time. Two or three hours is as short an interval as is admissible. As a general rule, it is better

that the patient should take food not more frequently than three or four times a day.

The supply of an abundance of fresh air by proper ventilation is by no means the least important measure necessary in the successful treatment of fevers, as, in many cases, the morbid action is a result of inflammation excited by poisonous germs. Ventilation is also necessary for the safety of nurses and attendants. The temperature of the room should be kept as low as possible without inconveniencing the patient. As a general rule, 60° to 65° is a proper temperature.

In many cases the discharges of the patient are the most efficient means for communicating the disease. They should be promptly and thoroughly destroyed by the use of disinfectants. The night-vessel should constantly contain a solution of copperas, or a strong solution of chloride of zinc or permanganate of potash. This will secure disinfection of the discharges as soon as passed. Immediately after it has been used, the vessel should be removed from the room, and its contents buried in the earth at a safe distance from any well or cistern. (See pages 441 and 442.) The discharges of a patient suffering with any contagious or communicable disease, should not be placed in a common privy or water-closet. A neglect to observe this precaution has often resulted in the wide dissemination of infectious maladies. For the majority of fever patients, careful nursing is more indispensable than the most skillful medical treatment.

Cautions.—Do not depend upon drugs for lowering temperature. Water is unquestionably the best of all known means for reducing temperature in fevers. Winternitz, Brandt, Bouchard, and all other eminent authorities agree in this. It must be remembered, however, that an abnormally high temperature may be due to either one of two causes: (a) the excessive production of heat; or (b) the deficient elimination of heat. It is possible, of course, that both of these causes may be in operation at the same time. The application of cold water diminishes the production of heat at the same time that it conveys heat from the body. In order, however, that the temperature of the internal organs should be lowered, it is necessary that the blood-vessels of the skin should be well dilated so that the blood may circulate freely through the skin. In other words, the skin must be warm. In case the skin is cold, the appli-

cation of cold water might have the effect to diminish the elimination of heat by still further diminishing the circulation of blood in the skin. The temperature of the blood is always higher in the internal organs than at the surface. The blood is cooled by being spread out upon the surface, and the internal organs are cooled by means of the cooler blood brought to them in the veins which return the blood from the skin. It is, of course, possible to use the mucous membrane as well as the skin, by bringing cool water in connection with it.

It should also be mentioned that exercise of any sort will cause a rise of temperature, and that in fever, even a slight amount of exercise will cause a much greater rise of temperature than under ordinary conditions. Bearing these facts in mind, the pertinence of the following cautions will be appreciated: —

1. Never apply cold to the surface of the body when the surface is already cold, no matter what the internal temperature may be; instead, apply heat. A hot blanket pack, a sheet wrung out of hot water, fomentations to the abdomen or spine, a hot enema, a hot foot bath, the application of rubber bags filled with hot water, or other means by which dry heat may be applied, — these and similar measures should be adopted in all cases in which the high temperature is associated with a cold surface.

2. Cold should never be applied to the skin when in a state of perspiration, no matter what the internal temperature may be. Sweating is nature's method of cooling off the body, and when the skin is in a state of active perspiration, the body is being cooled more rapidly than can be successfully done in any other way. Wipe the skin frequently with a dry cloth. Take care to prevent chilling.

3. Never apply cold to the surface when it is blue, or when the skin presents a "goose-flesh" appearance. In these conditions apply heat.

4. Chilly sensations, even if the skin is hot, indicate that cold should be applied with great care if at all. It is well in such cases to precede the application of cold by a short hot application. A very convenient method of doing this is the hot sheet. The sheet should be wrung out of water as hot as can be borne and wrapped quickly around the patient. If left uncovered, evaporation will take place, and while the effect of the heat is to dissipate the sensation of chilliness, it will lessen the heat production and the subsequent cooling will lower the temperature, and this without producing any

decided chilly sensations. A hot bag at the spine or over the stomach while cold applications are made to other parts of the body, will often prevent chilling. In some cases it is possible to apply cold to a limited area, as to the back or the abdomen, or to the head, without producing chilliness, and with the effect of lowering the temperature. The cool enema may be employed in many cases in which other cold applications give rise to chill and a consequent rise of temperature.

5. Cold is only indicated when the surface is dry and hot.

6. Avoid shocking the patient by the sudden application of water at too low a temperature. Give the graduated cold bath thus: begin with a temperature 3° or 4° below the patient's temperature. Lower the temperature at the rate of 1° every four minutes until a temperature of 85° or 80° is obtained. This bath given six to eight times daily is largely employed in the hospitals of Paris in the treatment of typhoid fever.

7. All fever patients require large quantities of water — at least half a glassful every hour. Weak lemonade may be used instead of water, or other fruit juices well diluted.

8. A common recommendation to sustain fever patients by milk almost exclusively is an error. Milk disagrees with many persons when well, and does not disagree less with the same persons when sick. Most fever patients, especially patients suffering from typhoid fever, have dilated stomachs, as has been shown by Bouchard. Glenard has shown that milk must be interdicted in all cases of dilatation of the stomach, hence the absurdity of recommending milk as a routine diet for any fever. Thin water gruels are of first importance as a nutrient in fevers of all classes. Barley water was recommended by the father of medicine, Hippocrates, nearly 2,000 years ago, and we are just beginning to find out that there is nothing better. Thin barley water was used by him at the beginning of the disease, and barley gruel at the end of ten or twelve days, increasing the quantity and the thickness of the gruel as the patient approached convalescence. There is no better plan to be proposed at the present time. The diet may be varied by the employment of fruit juices of various sorts, fruit purées, and various preparations of grains. Granola mush, gluten gruel made from products of the Sanitarium Health Food Company, Battle Creek, Mich., are to be highly recommended for use in cases of this class. For a brief description of these foods, see the Appendix.

FEBRICULA.

SYMPTOMS.—Attacks generally abrupt; weakness; loss of appetite; chilliness; skin very hot; pulse rapid; severe pain in forehead; pain in back and limbs; constipation; urine scanty and dark.

This disease is also known by the names ephemeral, irritative, or inflammatory fever. It is the mildest form of fever, and generally lasts from one to three days, though it sometimes continues a week or ten days. It is not accompanied by delirium, and is distinguished from typhoid fever by the absence of the characteristic symptoms of that disease.

Causes.—The principal causes of febricula are overwork, overeating, loss of sleep, sexual excesses, and exposure to the heat of the sun. It is probable that many cases supposed to be febricula are really cases of typhoid fever in which the disease is checked before its characteristic symptoms are manifested.

Treatment.—Rest in bed, fasting for a day or two, and the use of cool or tepid sponge baths, compresses, and enemas. Patients always get well.

TYPHOID FEVER.

SYMPTOMS.—Lassitude; irregular chills, sometimes followed by perspiration; frequently headache; confusion of mind; irritability of disposition; no appetite; nausea or vomiting; nosebleed; pain in back and limbs; looseness of the bowels; as the disease advances, countenance becomes dull and stupid; cheeks, hands, and arms red, or of a dusky hue; wakefulness; more or less delirium in severe cases; patient talks in his sleep, tries to get out of bed, picks at the bedclothes, etc.; jerking movement of the tendons at the wrist; tongue coated whitish, yellowish, or brownish, usually smooth and glassy, or dry and hard—tremulous; a brownish accumulation on teeth and lips; bleeding of gums; bowels distended with gas; tenderness low down on the right side; gurgling on pressure; hemorrhage from the anus or bowels, or both; a few slightly elevated rose-colored spots on the abdomen; fever less in the morning; increased in the evening; pulse ninety to one hundred and twenty.

This is a general febrile disease, attended by local affection of the glands of the small intestines. For several days preceding the attack, the patient feels weak, debilitated, and a general indisposition. What is termed the forming period of the disease lasts about four days. The severity of the attack is indicated by the temperature. When the thermometer shows a temperature of 106° or 107°, the case may be considered exceedingly grave. The severity of the disease itself is often greatly increased by complications, the most serious of which are pneumonia, inflammation of the parotid glands as in mumps, peritonitis, and

hemorrhage. The duration of the disease is generally from two to four weeks. The popular belief in critical days does not seem to have a very solid foundation. In some cases, the brain symptoms do not disappear with the occurrence of convalescence. In occasional instances, the illusions or delusions incident to the delirious stage of the disease continue for a short time after all other symptoms have disappeared. Recovery from this condition generally takes place, however, in from one to three weeks. In a case of this kind which occurred in our practice a few years ago, the patient was subject to marked religious delusions, which disappeared, however, in a very short time, as his strength returned. Cases frequently occur in which the symptoms of disease are not sufficiently severe to confine the patient to bed. These are termed "walking cases" of typhoid. As a general rule, patients gain flesh very rapidly after recovery begins, often acquiring a greater weight than at any previous time. Young persons grow more rapidly than usual.

Causes.—Typhoid fever is, by many physicians, supposed to be produced by a specific germ, which is communicated chiefly by means of the bowel discharges. It is believed that when the discharges are mingled with other human excreta, as in privy vaults, sewers, etc., the germs will affect the whole mass. Others believe that the germs may originate outside of the body, under certain conditions. This theory does not necessitate belief in spontaneous generation, as it is held that germs which, under ordinary circumstances, may not give rise to disease, or, under certain other peculiar circumstances, may give rise to other diseases, may, under circumstances not fully understood, but the existence of which is entirely possible, give rise to the disease known as typhoid fever. These germs, however they may originate, are generally received into the system by means of drinking-water. Wells and cisterns often become contaminated by means illustrated and described on PLATE XVI. Milk has also been known to be a carrier of typhoid-fever germs, becoming infected through the use of water containing germs either in diluting the milk, or in washing the milk cans or other vessels in which it was placed. It has also been claimed that milk may be contaminated through the drinking of infected water by cows. Recently an epidemic of typhoid fever in which a large number of persons were affected by the disease, occurred in Germany, the cause of which was traced to the use of meat from the body of a calf which, as was afterward proven, had died of typhoid fever.

It is thought by some that the inhalation of sewer gas, and of the foul odors from neglected privies, cesspools, etc., may occasion typhoid fever; but it is possible that, in these cases, the disease is somewhat different in character, although allied to this affection. Fever originating in this way has been termed cesspool fever.

Treatment.—Typhoid fever is clearly a preventable disease, which may also be said of all other infectious and contagious diseases. Since its communicability has been established beyond question, it is of the greatest importance that proper measures should be taken to prevent the contraction of the disease by others, as well as for the relief and recovery of the persons suffering. The proper preventive measures to be adopted are boiling of milk and drinking-water, and avoidance of all sources of contamination, thorough ventilation of the sick-room of patients suffering with the disease, destruction of the germs in the discharges of the patient by disinfection and burying at a safe distance from any well, cistern, or other sources of water supply. (See chapter on "Disinfection.")

The general management of the disease should be precisely as has been described for fever. (See page 1182.) In some cases, by the adoption of vigorous measures, especially by the employment of the wet-sheet pack, hot-air bath, Turkish bath, and other means for exciting vigorous perspiration at the outset of the disease, it may, perhaps, be aborted. We have succeeded in a number of instances in breaking up the disease when it had advanced sufficiently far to leave little doubt as to its real character. The fever should be controlled by means of sponge baths, cold compresses to the bowels, ice packs, and cold enemas. The delirium and sleeplessness are best relieved by ice compresses, or the ice pack applied to the head. When discomfort is occasioned by pain or gas in the bowels, fomentations should be applied once or twice a day, or every three or four hours, according to the requirements of the case. The use of stimulants is never called for. We formerly employed them, when the patient seemed to be sinking with exhaustion from the long continuance of the disease, but are now perfectly certain that we have never obtained any marked benefit from their use, though we hope we have done no harm.

In the treatment of a large number of cases of this disease, we have had no occasion for the employment of such large doses of quinine as have lately been recommended by some eminent German

physicians. More than 7000 cases have been treated by this method, with a mortality of only about six per cent. Stieler treated a large number of cases at Munich, losing less than six per cent. Jürgenson reports a mortality of only three and one-tenth per cent. Brandt claims to have lost only two and one-tenth per cent. Glénard treated fifty-two cases at Lyons without a single death. We might mention many others who have been equally successful, but will only add our own experience in the treatment of over one hundred cases, by the aid of an assistant physician and a medical student, without losing a single patient, although in many cases the disease appeared in its worst form. When the plan of treatment pointed out can be pursued thoroughly and systematically from the outset, death will result in only a very small proportion of cases.

TYPHUS FEVER—SHIP FEVER.

SYMPTOMS.—Before the attack, slight chills; headache; disturbed sleep; no appetite; cough; coryza. The attack generally begins with severe chill, followed by continued fever; patient confined to bed; heaviness and numbness in head; dizziness; flashes of light before the eyes; noises in the ears; deafness; pain in the limbs; trembling; stupor; delirium; pulse one hundred or more; temperature high; urine scanty; eruption, resembling that of measles, but not appearing on the face; thick, brown coating on the tongue.

The common name for this affection is ship-fever, which is derived from the fact that the majority of cases occurring in this country may be traced to importation through immigrants, particularly those coming from Ireland, where the disease occurs much more frequently than in this country. The symptoms of this disease are very similar to those of typhoid fever,—stupor and delirium being still more characteristic of typhus than of typhoid fever. It occurs most frequently in years of famine, when people are badly fed, and seems liable to attack persons in military camps, prisons, crowded barracks, tenement houses, and on shipboard, where a large number of persons are crowded into poorly ventilated cabins. The active symptoms of the disease generally terminate quite suddenly with a profuse perspiration, after which the patient slowly recovers. The disease is very contagious.

Treatment.—With reference to the treatment of this condition, the eminent Lebert remarks, "Drugs, as such, are unnecessary. I give them chiefly to satisfy the patients and their friends." The same plan of treatment may be followed which has been recommended for typhoid fever. Especial attention should be given to the application of cold or

ice compresses to the head, as by this means the stupor and delirium will be greatly relieved. The frozen compress applied as elsewhere directed may be usefully employed. (See pages 1182–1186.)

If the patient bears cold treatment well, compresses and sponge baths at a temperature of sixty or seventy degrees should be employed as far as possible to keep the fever subdued. The cold enema should be resorted to whenever other measures fail to give prompt relief. If the patient is very restless, a warm bath or warm blanket pack may be employed, the head being kept cool during the application by the ice-cap or rubbing with ice. The same care respecting diet, ventilation, disinfection, etc., should be observed as directed for typhoid fever. After the patient's recovery, the clothing and everything used about the patient should be thoroughly disinfected by exposure in a tight compartment, as, for instance, a bleaching box, to the fumes of burning sulphur. The room in which the patient has been sick, should be disinfected in the most thorough manner. The paper should be removed from the walls, carpet from the floor, and after thorough disinfection with sulphur (see page 577), should be thoroughly scrubbed and newly whitewashed. These measures should be attended to with very great thoroughness, as the disease is a very communicable one.

RELAPSING FEVER.

***SYMPTOMS.**—Begins with a chill, followed with high fever; great weakness; headache; dizziness; ringing in the ears; pain in back of neck, small of the back, and in the limbs; general muscular pains throughout the body, increased by pressure or movement; unnatural sensitiveness of the skin; tongue white, with red tip; pulse from one hundred and ten to one hundred and twenty; temperature rises rapidly from one hundred and seven to one hundred and nine degrees; catarrh of the pharynx; usually constipation, but occasionally diarrhea; liver inactive, generally enlarged; spleen greatly enlarged; urine scanty, containing bile; at the end of one or two weeks, crisis, with sudden disappearance of fever and pain; after six or eight days, return of previous symptoms; three or four relapses may occur.*

Causes.—According to Lebert, the cause of relapsing fever is a peculiar microscopical organism which appears in the blood of the patient suffering with this disease, in the form of delicate spiral filaments, which are about $\frac{1}{25000}$ of an inch in diameter, and $\frac{1}{125}$ of an inch in length. They are coiled in a spiral form, and have a lively, twisting motion. The disease is clearly contagious, being communicated by the conveyance of these parasites from one person to another. It is probable that drinking-water is one of the most common means of communication.

Bad food, unsanitary conditions, and crowding of many people together are the principal predisposing causes. Some observers believe that the disease may be communicated by contact of one patient with another. Various epidemics of this disease have occurred, particularly in England, Ireland, Scotland, and Russia. The Irish epidemic extended over a large portion of that country, lasting four years. In 1847, the disease was imported into this country from Ireland. A few years ago an epidemic of the disease occurred in Berlin.

Treatment.—Fortunately, this disease is not a very fatal one. With reference to its treatment, Lebert says, "My recent, as well as my former, experience, has demonstrated the fact that there is no drug which may be said to exercise any direct influence upon the course of the disease. The expectant plan of treatment, therefore, is the only proper one. Rest in bed, fresh air, cleanliness, fever diet, milk, ... and cooling drinks, are the principal things to be attended to." "Clear, pure water, and carbonic acid water, are, as a general thing, the beverages best borne." The general treatment recommended for fever should be pursued. Ice should be applied to the head to relieve the headache, cool sponging, compresses, and cool enemas, should be used to reduce the temperature. When the pain is severe, it may be relieved by the hot blanket pack, applied once or twice a day for half an hour. The majority of patients have a craving for acid, and may take lemon juice as freely as desired. For the soreness and pain at the pit of the stomach, apply hot fomentations three or four times a day, fifteen or twenty minutes each time. As this is a contagious and infectious disease, the same precautions should be taken respecting disinfection during and after the attack as has been recommended for typhoid and typhus fevers.

BILIOUS TYPHOID.

SYMPTOMS.—Pain in the head; dizziness and faintness; chills; pain in the limbs, especially the muscles and joints of the legs; continuous fever; restlessness; coated tongue; vomiting watery or bilious matter; soreness at pit of stomach; after a few days, temperature rises very high; skin dry and hot, or red and sweating, the headache intense; eyes red; roaring in the ears; obtuseness of the mind; diarrhea; pain in the region of the spleen and liver from enlargement of those organs; jaundice; disease lasts from ten to fourteen days

This disease, in some respects, resembles the first attack of relapsing fever with which it is often combined.

Causes.—Although the disease has not been very thoroughly studied

as yet, having been recognized but a short time, it is believed to be infectious in character, although probably not contagious.

Treatment.—The treatment is the same as that previously recommended for relapsing fever. When the diarrhea is troublesome, apply cold compresses over the bowels, and administer cool enemas three or four times a day.

YELLOW FEVER.

SYMPTOMS.—Disease usually preceded for two or three days by lassitude, headache, no appetite, pain in the head, chilliness.

FIRST STAGE: *Begins with chill, followed by fever; severe headache; pain in back and lower limbs; tenderness at stomach; nausea and vomiting; eyes red and watery.*

SECOND STAGE: *After one to three days, fever and other symptoms abate or cease; patient may improve until recovery takes place.*

THIRD STAGE: *Severity of symptoms reappears, greatly aggravated; jaundice; black vomit; nosebleed; at last, stupor.*

This disease has several times attracted attention within the last twenty years on account of the terrible epidemics which have almost depopulated some portions of the South. The symptoms above given present but an imperfect picture of the disease, as every case is more or less modified by individual peculiarities, and various other circumstances. The disease seems to vary in different epidemics, in some cases running a mild course, in others, raging with a violence and intensity which sweeps all before it. In addition to the black vomit, due to hemorrhage from the stomach, albumen in the urine, from acute inflammation of the kidneys, is a very grave symptom which is present in the great majority of cases.

Causes.—Careful investigations of this subject recently made under the auspices of the American Public Health Association, the Yellow Fever Commission, the National Board of Health, and various local sanitary organizations, have resulted in throwing great light upon the nature of this grave malady, although there are many questions of importance which cannot be said to be perfectly settled. There is little room left for doubt, however, as to the contagious nature of the disease, while its infectious character is fully established. It is generally considered as proven that the disease is directly due to infection of the system by a specific germ, although there is still considerable discussion as to whether this germ necessarily originates with the yellow fever pa-

tient, or may be developed independently under certain unsanitary conditions.

Treatment.—The first and most important measure of treatment to be considered in the management of an epidemic of this disease is prevention. The ravages of the malady cannot be checked in any way but by the enforcement of the most rigid quarantine, and the employment of vigorous disinfection. The most scrupulous attention to sanitary measures of all kinds is absolutely necessary. A patient suffering with the disease should be isolated from those who are well. Depopulation of the infected cities was found to be one of the most efficient measures for checking the progress of the epidemic during the prevalence of the disease in the South, in 1878–79. The measures employed in the active treatment of this disease have been as diversified as the theories of its origin. Some physicians have employed mercury, quinine, whisky, and other drugs, in large quantities, and others have declared with emphasis that no benefit is derived from the use of drugs. In analyzing the course of treatment prescribed by a large number of physicians who have had experience in the treatment of this disease, we have observed that there is a decided tendency on the part of those who have had the most experience, especially in severe epidemics, to rely more and more upon hygienic measures.

Col. J. M. Keating, of Memphis, Tenn., editor of the Memphis *Daily Appeal*, has prepared a very complete history of yellow fever, and the yellow fever epidemic of 1878 in Memphis, which contains, among much other valuable matter, a full description of the various plans of treatment pursued by the most eminent physicians of Memphis, Louisville, New Orleans, and other cities subject to this disease. The treatment pursued by Dr. R. W. Mitchell, who was medical director of the Howard Association of Memphis, and is now a member of the National Board of Health, seems to be a very rational method, and, as Dr. Mitchell says, is "the plan of treatment which observation and experience have proven to be the best." Dr. Mitchell remarks further, respecting the treatment of the disease, "Being self-limited and one of very short duration, what could possibly be the aim of rational treatment beyond warding off complications, and sustaining nature?" In accomplishing this, Dr. Mitchell prescribes little or no medicine. He directs the patient to be put to bed as soon as the attack occurs, and kept there until convalescence is fully established. As the disease begins with a chill, measures should be promptly taken to bring about

a reaction. This may be best accomplished by covering the patient with woolen blankets, putting the feet into a tub of hot water, introduced under the bedclothes, and surrounding him with hot bags, bricks, bottles filled with hot water, etc. When the bowels are constipated, the patient should take a thorough enema. The pain in the head is best relieved by cold applications ; the pain in the back may be relieved by fomentations. Gentle perspiration should be kept up for fifteen to twenty hours by keeping the patient covered with warm blankets, or giving him warm drinks. If the fever rises very high, cool or tepid sponging with water, or equal parts of water and alcohol, should be applied every hour or two. The cold enema may also be employed with advantage. If suppression of the urine occurs, the fever being very high, ice compresses, or compresses of ice and salt, should be applied over the small of the back for fifteen or twenty minutes at a time and repeated every thirty to sixty minutes. To relieve the soreness of the stomach, apply hot fomentations. To relieve vomiting, give ice. If obstinate, employ lavage.

No food should be taken for two or three days, and then should consist of barley-water or thin oatmeal gruel, milk and lime-water in the proportion of three parts milk to one of lime-water, buttermilk, or some equally simple and nutritious food. When convalescence is established, the quantity of nourishment may be gradually increased, but no solid food should be taken for two or three weeks. When a patient suffers with a great degree of muscular soreness, a warm pack may be given occasionally. The vapor bath is recommended by many physicians, and others have employed cold baths with advantage. Dr. Mitchell declares that when his plan of treatment is scrupulously followed, a large majority of cases recover.

THE PLAGUE.

SYMPTOMS.—Chill, followed by fever; dizziness; thickened speech; high fever; tongue coated, becoming dry and cracked, and covered with black crusts; delirium, followed by stupor; swelling of the glands in the groins, armpits, and around the neck; black and blue spots on the skin.

This is a disease which, fortunately, seldom, if ever, visits this part of the world, although it prevails more or less at intervals in Turkey, Prussia, and Russia. Its severest ravages are confined to the region of the Black Sea. The disease is both infectious and contagious. It is usually developed in from two to seven days after exposure. It is

very fatal, running its course in from three to five days. Eighty to ninety per cent of all who are attacked, die. When recovery occurs, improvement begins the latter part of the first, or by the middle of the second week. During the outbreak in China in 1894, the germ of the disease was discovered.

In the Middle Ages, this malady frequently prevailed to such an extent in some of the European countries as to almost depopulate them. Terrible epidemics of the disease occurred in Egypt and Assyria before the Christian era. Several times this malady has seemed to die out, but has broken out anew, and it is probable that it continues to exist in a mild form in some of the countries which appear to be its native home. It is undoubtedly the most fatal of all infectious diseases.

Treatment.—In respect to no disease have the advantages of thorough quarantine been so well illustrated as in this. The necessity for isolation of infected individuals was well understood many years ago. When the plague broke out in a little town in lower Italy, an army was sent to prevent any individual from escaping into the surrounding country, and in order to make the quarantine more complete, the village was surrounded by three deep ditches, which were kept by soldiers under strict orders to shoot any individuals who attempted to escape. Almost equally vigorous measures were taken by the Russian government during the recent epidemic in that country. The good results were shown in both instances in the staying of the progress of the disease. There is no special plan of treatment which seems to have any particular influence upon this terrible malady. The best that can be done is to treat patients upon general principles. At the beginning of the disease, when the fever is high, cold should be applied. Fomentations and poultices should be applied to the suppurating glands.

The Black Death.—This is a malady which very closely resembles the plague, and is by some authors supposed to be identical with it. In the fourteenth century, an epidemic of this disease spread over the whole known world, destroying a great proportion of the human race. It is probably still perpetuated in some provinces of East India, particularly in the vicinity of the Himalayas.

SWEATING SICKNESS—MILIARY FEVER.

***SYMPTOMS.**—Attack preceded for two or three days by irritation of the skin, dryness of the mouth, thirst, headache, general weakness, bad feeling in the stomach, with peculiar sensation; ringing in the ears; dizziness. The disease generally begins in the night with a chill, or chilliness, followed by very profuse sweating, which is accompanied by prickling and stinging of the skin; skin hot; pulse exceedingly rapid; extreme headache; palpitation and pulsation at the pit of the stomach; stomach sensitive, painful on pressure; occasional spasms in limbs; rash appears on the third to the seventh day, other symptoms being aggravated; eruption consists of small, round, irregular spots, which vesicate and burst in two or three days; rash first appears on side of the neck and chest, extending downward upon the back and lower extremities; great restlessness, often delirium.*

Causes.—Very little is known concerning the cause of this malady, although it is believed to be a germ disease. It is sometimes a very fatal malady, though in its epidemics, few fatal cases have occurred.

Treatment.—The treatment consists in allaying the fever in the first stages of the disease by means of cold compresses, sponge baths, cool enemas, ice to the spine, etc. Especial attention should be given to thorough ventilation, and also to such other measures as have been recommended for the treatment of other infectious diseases. Bathing the skin with warm solutions of alum or vinegar is a useful measure, much employed in Germany. The pain at the stomach is best relieved by cold applications.

ERYSIPELATOUS FEVER—BLACK TONGUE.

***SYMPTOMS.**—Fever, erysipelatous swelling of various parts of the body, most often the head; in severe cases, delirium; neuralgic and rheumatic pains.*

Erysipelatous fever is distinguished from the local disease known as erysipelas, which is generally accompanied by fever, by the fact that in this disease the fever makes its appearance first, and the local disease afterward, while with the local affection the opposite is the case. The disease sometimes occurs in epidemics, some of which are very fatal. This was especially true of an epidemic which occurred about fifty years ago in different parts of the United States, which was characterized by peculiar blackness of the tongue, from which it obtained the name *black tongue.*

This disease, like others of this class, is in all probability produced by the reception into the system of certain germs. Different observers have

traced a similar connection between this and other infectious diseases, but nothing very positive has been established.

Treatment.—The general fever should be treated by the same measures which have before been recommended for the treatment of fever (page 1182). The local manifestations of the disease should be treated by means of cold applications at first, followed by warm applications or poultices when the heat and redness give place to a blue, purple, or scarlet hue.

DENGUE—BREAK-BONE FEVER.

***SYMPTOMS.**—Loss of appetite; chilliness; lassitude; after one to four days, fever, lasting from nine hours to four days, attended by pain in the head, eyes, muscles of the head, back, and limbs; then fever and other symptoms diminish; after three or four days, symptoms return; general eruption occurs which may resemble scarlet fever, measles, nettle-rash, or chicken-pox; in some cases, the patient suffers with nosebleed or bloody diarrhea.*

This is not a very common disease, but several quite extensive epidemics have occurred in Charleston and other cities in the South. In one epidemic, all the inhabitants of a town of moderate size suffered from the disease, with the exception of half a dozen who had had it before.

Fortunately, the disease is not very fatal, although recovery is usually very slow. It is thought by those who have observed it, to be both infectious and contagious.

Treatment.—The fever should be subdued by cool or tepid sponging, cool compresses, and cool enemas. Pains in the back and limbs are best relieved by warm baths, hot blanket packs, and hot sponging; cold should be applied to the head to relieve the headache. The diet should be very spare.

INFLUENZA—CATARRHAL FEVER—LA GRIPPE.

***SYMPTOMS.**—Chilly sensations and flashes of heat; cold in the head, with copious, irritating discharge; eyes red and tearful; tickling in the throat; hoarseness; soreness of the throat; dry, irritating cough; pain and difficulty in breathing; great weakness; high fever; sleeplessness, or unnatural drowsiness; duration of disease three to ten days.*

This a disease which often affects whole cities or States at the same time, often making its appearance with great suddenness. Not infrequently lower animals are affected at the same time with human beings. The disease is undoubtedly infectious, though not contagious. It is rarely fatal, recovery usually occurring within a very few days,

although local irritation of the air-passages and general weakness may continue for some time.

Treatment.—Warm blanket packs, vapor baths, hot-air baths, fomentations to the lungs, and cool or tepid sponging, with cool compresses when there is considerable fever, are the most important measures of treatment. The inhalation of hot steam should be tried when there is much bronchial irritation. When the nasal passages are obstructed, much relief will often be obtained by rubbing the nose with sweet oil or vaseline. The Perfection Vaporizer and antiseptic throat solution, B. C. M. E. W. (see Appendix), will be found of great value.

MUMPS, OR PAROTITIS.

SYMPTOMS.—Slight fever; headache; loss of appetite; swelling near the lobe of the ear, accompanied by heat and pain; motion of jaws painful and difficult.

This common disease of childhood usually runs a very mild course. The patient has first a chill, or slight shivering, followed by slight fever for two or three days, in most cases, when the parotid gland begins to swell, usually upon one side at first, the swelling being behind the angle of the jaw near the lobe of the ear. In some cases pain on motion of the jaws is the first symptom. After a little, the swelling extends to the other side. The swelling also extends to the throat, sometimes embarrassing respiration. The patient does not usually suffer much pain when quiet, but eats and talks with difficulty on account of the pain caused by motion of the jaws. After five or six days the fever ceases, and in the course of eight or ten days the patient is well again. It sometimes happens, however, that instead of so prompt and favorable a termination, suppuration takes place. The swelling becomes very painful, hard and dark red, and matter forms, which is discharged through an opening in the cheek or through the external canal of the ear. Another complication, known as *metastasis*, also sometimes occurs. In these cases the disease seems to subside in the parotid gland and makes its appearance somewhere else. In males the testicle and scrotum are the parts affected; in females, the breasts, vulva, or ovaries may be affected. In some instances the membranes of the brain become the seat of the inflammation. The disease occasionally runs its course in the original place and the new seat at the same time. In most of these cases, as well as in the simpler form of the disease, the inflammation subsides in a few days and complete recovery takes place. Suppuration may occur, how-

ever, in any of the parts affected, and hence the danger is increased by these complications.

Cause.—This is an epidemic disease, and is generally believed to be contagious. The period of incubation, that is, the length of time which elapses after exposure before the symptoms of the disease appear, is six to fourteen days. The disease affects males more frequently than females, and children more often than adults.

Treatment.—Prof. Vogel, an eminent German physician, asserts that mumps ordinarily require no medicinal treatment, and that "avoidance of injurious influences, rest, anti-febrile [vegetable] diet, and equable warmth, suffice, as a rule, for the restoration of normal health." Instead of "heating herb-bags or cataplasms," he recommends simple inunctions of the affected parts, and the use of ice-compresses. He explicitly states what many people will undoubtedly learn with surprise that "the use of cold is never dangerous" in this disease. Irritating liniments, mustard plasters, and even blisters and other means of counter-irritation, have been employed as local remedies to prevent metastasis—a change of the seat of the disease. We believe these substances to all be injurious and prejudicial to recovery; and we are glad to find our view supported by so eminent an authority as the renowned Dr. Niemeyer, who well remarks that "experience has shown such treatment can only prove injurious." Our plan of treatment is the following:—

The patient is directed to abstain entirely from the use of all animal food but milk, which may be taken if it does not disagree with digestion. The diet is made to consist chiefly of cooked fruits, and grains in the form of gruels, as oatmeal and barley gruel, with softened graham toast. This the patient can eat easily. Cool, acid drinks are allowed to be taken freely. One or two warm, not hot, baths, or two or three tepid sponge baths, should be taken daily if there is much fever. Warm sitz baths are especially useful as derivative means of treatment, relieving the pain and congestion when it is severe. They may be employed once or twice a day in severe cases. When given at a temperature of 95°, the bath may be continued for ten minutes; at 90°, nine minutes; at 85°, one minute. Apply to the neck cool or cold compresses, according to the intensity of the inflammation. When the cold becomes unpleasant, as it frequently does, apply mild fomentations for fifteen or twenty minutes, when the cool compresses may be renewed for an hour or two, or until they become unpleasant again, then being exchanged for the

fomentations for a short time. By this means, constant applications may be kept up and the severity of the disease much mitigated and its duration shortened. If evidences of suppuration appear, exchange the cool compresses for fomentations or a poultice, so as to hasten the process, and have the abscess opened with a lancet as soon as the evidences of the presence of matter are distinct. A safe rule is to continue the application of cold so long as the swelling is hard and acutely painful to pressure; when a softened place is to be felt in the middle, fomentations should be applied. If the bowels are constipated, they should be relieved by means of the enema, and by the employment of manipulation and fomentations of the abdomen.

Metastatic parotitis is a form of inflammation of the parotid gland which occurs in connection with other diseases. It is not contagious. The principles of treatment are the same as those given for mumps. Suppuration is much more common in this form.

CHOLERA.

SYMPTOMS.—THREE STAGES: ***1. Vomiting and purging; fluid stools resembling rice-water. 2. Contracted pupils; spasms; cramps in abdomen and lower limbs; skin cool; pulse intermittent. 3. Suppression of the urine; great thirst; feeble pulse; difficult breathing; tongue and breath very cold; lips and skin blue; voice husky and unnatural; features pinched and shrunken; headache; drowsiness; coma.***

The symptoms are not very greatly different from those of bad cases of cholera morbus. In fact, when cholera is prevailing, it is generally considered impossible to distinguish between the two diseases. The disease may vary in intensity from simple cholerine to the gravest form of the disease. When an epidemic is prevailing, all cases should be subjected to vigorous measures of treatment.

Causes.—True, or Asiatic, cholera is one of those much-dreaded diseases which occur in epidemics, frequently almost depopulating the infected districts, often half of those attacked by it dying within a few days. The disease is undoubtedly a contagious one, being communicable from one to another, though not exactly in the same sense that small-pox, scarlatina, and similar diseases are contagious. Experiments have shown that the disease is not communicated by the direct or indirect contact of the body of the person affected, by the products of respiration, or by exhalations from the skin, but by discharges from the bowels. They are supposed to contain a specific germ peculiar to this disease, and the real cause of the affection. Facts seem also to support the idea that the germs of the cholera disease are less active in the

bowel discharges when they are fresh than after decomposition has progressed for a few days. The circumstances which favor the decomposition of organic matter seem very clearly to favor the extension of cholera after it has once been introduced. Careful investigations have clearly shown that the most common means by which cholera poison reaches the system is through drinking-water, and perhaps, in some instances, food. Wells become contaminated from cesspools, sewers, etc., which have received the discharges from a cholera patient, and thus the disease is sown broadcast. The native home of cholera seems to be in India, where in certain districts it constantly exists, being disseminated to neighboring countries, even to the most distant parts of the globe, through various means of human intercourse. A singular periodicity in the occurrence of cholera has led some visionary theorists to very strange conclusions respecting its cause. Observing that the great epidemics of the disease occurred about every twelve years, a certain Dr. Knapp of Mexico originated a few years ago the idea of planetary pestilence, his theory being that the disease is caused by the increased planetary attraction "incident to the perihelion of Jupiter, which also occurs once in twelve years." Dr. Knapp based his theory wholly upon the fact that the perihelion of Jupiter and the occurrence of great cholera epidemics take place in the same year. Taking this for a starting-point he proceeded to predict the occurrence of cholera and other epidemics with unexampled severity in the next decade,—1880–1890,—during which time the perihelion of Jupiter and that of several other large planets occur in conjunction. All that is required to show the fallacy of this theory is to find a sufficient explanation for the periodicity of cholera epidemic. This explanation is found in the following facts: The natives of India make periodical pilgrimages to Hurdwar, at the head of the Ganges. "Hundreds make the Juggernaut pilgrimage every year. Much larger numbers make the journey every third year. Every sixth and ninth years the number is still greater; and once in twelve years an immense throng, numbering more than three million people, make this long pilgrimage.

"Poor food, impure water, together with depressing meteorological conditions and the entire absence of any sanitary precautions, result in the production of the disease well characterized as Asiatic cholera. There is more or less of the disease every year; but once in twelve years, at the great pilgrimages, it assumes such proportions that it extends beyond the limits of its original habitat and carries devastation

to thousands of households in the larger cities of Europe and even of this country.

"Once in sixty years there gathers at Hurdwar a throng of pilgrims still greater than is collected at the twelve-year pilgrimages. The consequence is the production of a still more formidable cholera scourge, of sufficient malignancy and strength to sweep over the greater portion of the Western as well as the Eastern continent before it is checked by the approach of the cold season."

The above statements are fully sustained by the eminent Dr. Peters, who has written a work in which he claims that since 1826 the cholera has regularly occurred as an epidemic at intervals of twelve years. He attributes the origin of each epidemic to the annual pilgrimages. He traces the course of two of these epidemics as follows:—

"In 1826 it became epidemic in Hindostan, its native home, and gradually spread until, in 1829, it was distributed throughout Russia, reaching England in 1830–'31.

"In the spring of 1832 it was brought to Quebec, whence it was carried up the St. Lawrence and across the lakes to Detroit, where it met the United States troops going to the Black Hawk war. It was distributed to all the national posts and forts in the then extreme West, being specially severe at Fort Dearborn, Chicago, Fort Crawford, near Prairie Du Chien, and Fort Armstrong, at Rock Island. From the latter place it was carried down the Mississippi River, striking New Orleans in October of the same year.

"Twelve years thereafter, or in 1841, this contagion started in another tour around the world. It was found at Hurdwar in 1843; at Afghanistan, in Persia, in 1845; at Teheran in 1846; and Astrakhan in 1847. In 1848 it reached Havre, and was carried to New Orleans in some German emigrant ships the same year. From New Orleans it followed the travel up the Mississippi and along the Ohio. From St. Louis it was carried over the emigrant route to San Francisco, and eventually was distributed over nearly the whole country. Thus it will be seen that within the space of fourteen years the country suffered two visitations from the terrible plague. The first time, being introduced at Quebec and following the rivers and lakes, it reaches New Orleans by going down the Mississippi; the second time, it starts at New Orleans and goes up the river, and is thus distributed."

The *Times of India* clearly traces the origin of the last epidemic to the same source. The epidemic began in 1867. "In that year three

millions of pilgrims, of whom a handful had come from a cholera district, assembled at Hurdwar, a few miles from the spot where the Ganges escapes from the Himalayas. On the 12th of April the three millions resolved to bathe and drink. The bathing-place of the pilgrims was a space 650 feet long by 30 feet wide, shut off from the rest of the Ganges by rails. Into this long, narrow inclosure, pilgrims from all parts of the country crowded as closely as possible from early morn to sunset; the water within this space during the whole time was thick and dirty,— partly from the ashes of the dead, brought by surviving relatives to be deposited in the water of their river god, and partly from the washing of the clothes and bodies of the bathers. Now, pilgrims at the bathing-ghant, after entering the stream, dip themselves under the water three times or more, and then drink of the holy water, while saying their prayer. The drinking of the water is never omitted; and when two or more members of a family bathe together, each from his own hand gives to the other water to drink. On the evening of the next day, the 13th of April, eight cases of cholera were admitted into one of the hospitals at Hurdwar. By the 15th, the whole of this vast concourse of pilgrims had dispersed, carrying the cholera in every direction over India; it attacked the British troops along the various routes, it passed the northern frontier, got into Persia, and so on into Europe, where it will work its wicked will for some time to come."

These facts expose the fallacy of planetary-pestilence theories so thoroughly that we do not need to adduce any further arguments. We should have considered the subject almost unworthy of notice were it not for the fact that considerable attention has recently been given to it by several popular newspapers which have published sensational articles tending to propagate the theory, without attempting any exposure of the fallacy.

Among the predisposing causes of cholera may be mentioned dissipated habits, the use of alcoholic drinks, unwholesome measures of diet, and anything which has a tendency to lower the vitality of the system. The use of cathartics is also to be deprecated when a cholera epidemic is prevailing. Mental depression is also a predisposing cause. It has been asserted that in cholera times thousands of persons die from simple fear of the disease, without having received into their system a single cholera germ; and it cannot be doubted that many who might otherwise escape harm are made unusually susceptible to the disease by excessive fear and dread.

Treatment.—The most important measures of treatment are of a preventive character, since it is generally acknowledged that severe cases are not likely to recover under any form of treatment. Preventive measures consist, first, in careful avoidance of all predisposing causes of the disease; second, in careful avoidance of all specific causes. The latter measure can be carried out only by the most rigorous quarantine, all communication being cut off by unaffected localities with those in which the disease is prevailing. The bowel discharges from patients suffering with the epidemic, instead of being emptied into cesspools or sewers, should be at once rendered harmless by disinfection. The best plan is to place in the vessel which is to receive the discharges a teacupful of disinfecting solution, consisting of one-half ounce of permanganate of potash or soda, and an ounce of copperas, to each pint of water. No water should be employed for drinking purposes that has not been boiled and filtered. Upon appearance of the first symptom—looseness of the bowels—warm baths, hot enemata, and fomentations to the bowels should be administered. The food should be little in amount, and of the most simple character. It should consist chiefly of fruits and grains. Meat should be avoided. If the symptoms increase, fomentations should be used more assiduously. The patient should be allowed to drink all the cold water he desires, but it should be given in small quantities at a time. Ice pellets of the size of a large bean or filbert are swallowed by patients with great avidity.

In extreme cases, where the skin becomes very cold, it should be rubbed vigorously with dry, warm flannels, and when necessary, with mustard water. Hot bricks should be applied, and the fomentations should be continued with increased vigor. If the patient comes to convalescence, great care should be exercised to prevent relapse from improper diet. The food must be of the simplest character for several weeks. No meat should be allowed until the activity of the stomach is fully restored. There have been hundreds of remedies advertised for this disease, but experience has shown the value of those mentioned. The hygienic treatment of cholera is undoubtedly the best of any which can be adopted. Everything depends upon the application of energetic measures of treatment at the very first appearance of the disease. Large, hot enemas and lavage, or washing of the stomach, should be employed as long as the purging continues. Rice and barley water should be the first food.

WHOOPING-COUGH—CHIN COUGH—PERTUSSIS.

***SYMPTOMS.**—Slight fever for eight or ten days, followed, sometimes accompanied, by violent paroxysms of coughing; coryza; hot, dry skin; restlessness; as fever subsides, cough acquires a peculiar shrill sound or whoop; expectoration of tough, viscid mucus; paroxysms of coughing often accompanied by vomiting; from three or four to six or eight times as many severe paroxysms occur each day.*

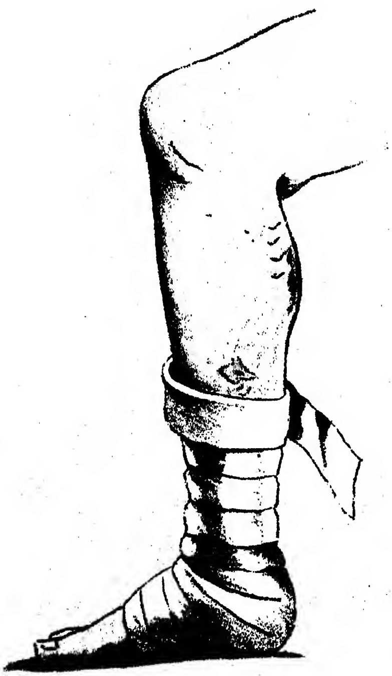
This disease is contagious, remaining latent about six days. The same person is rarely affected more than once. At its beginning, it is generally mistaken for an ordinary cold; the mistake is discovered, however, when the cough assumes its peculiar character. The cough is often preceded by a sensation of tickling in the throat. After a paroxysm, the patient is much exhausted, but in mild cases soon goes about as lively as ever. The cough is provoked by inhalation of cold air, laughing, crying, swallowing, and various other causes. The great cause of the cough, however, is the accumulation of tough, tenacious mucus in the throat. This stage of the disease may last only three or four weeks, or as many months. Finally, the tenacious mucus gives place to that which is thinner, less tenacious, and more easily expectorated. The cough is less severe and frequent, and the patient is beginning to recover, but the tendency to relapse is very great. With good care and proper treatment, the disease should not last more than four or six weeks. The results of the disease are sometimes quite serious. The violent coughing may give rise to hernia or rupture. Collapse of some portions of the lungs, and also emphysema, or dilatation of the air-cells, is another not infrequent result. This is the cause of the permanent shortness of breath in some cases. Whooping-cough may also lead to consumption. In many cases, an irritability of the mucous membrane is left, which occasions a cough much resembling the peculiar cough characteristic of the disease whenever the person takes a little cold. The disease rarely affects adults, and is seldom fatal.

Treatment.—Avoid exposure to the exciting cause. Give special attention even to the slightest cold when the disease prevails, as a cold predisposes to the disease as does a diarrhea to cholera in cholera times. The testimony of the most eminent physicians is that there is no specific for whooping-cough. The eminent Niemeyer declares that "we cannot ever ascribe any special curative influence to belladonna, a drug which has acquired great reputation. . . . On the other hand, we attach great value to well-managed treatment by sweating."

The disease must be treated like any other severe catarrh. The patient must be taken away from the sourse of infection with the disease when possible, as continued exposure to the cause will aggravate it very greatly. He should also be kept at as uniform a temperature as possible; and the temperature should be sufficiently warm to keep the skin in an active condition. Care should be taken to give the patient abundance of fresh air, but without exposure to drafts. In summer he may be out of doors during the middle of the day, but must not be exposed to the coolness of the morning and the evening. He should wear warm woolen clothing, particularly about the chest, and should have the neck protected by a thick flannel bandage. Once a day, if the patient is strong, he may take, with advantage, a warm blanket pack. The vapor bath and vapor inhalations are also remedies of great value in this malady. Fomentations and compresses to the chest are of great value in children old enough to take them readily. The child must be taught to restrain the cough as much as possible. After the mucus is expelled from the throat by coughing, there is no more occasion for cough, and it may be controlled by an effort of the will. An eminent German lady, who had had much experience with the disease, declared that "whooping-cough was only curable by the rod." The child must be told to stop coughing, and if necessary, compelled to resist the cough, as this is one of the most effectual means of cutting short the disease. The cough itself aggravates it, and the more it is restrained the less will be the disposition to cough. Very little, if any, medicine is needed. Simple soda water is one of the most useful remedies. It should be taken just before the paroxysm. The following is equally good used in the same way: Saleratus, half a teaspoonful; water, a large teacupful; sweeten with sugar, and flavor with cinnamon or winter-green if necessary. This will shorten the attacks of coughing by facilitating the expectoration of the tough mucus; "it loosens the cough." The common use of narcotics in this disease, especially in children, is to be condemned, since they are "apt to cause hyperemia of the brain." If used at all, their employment should be restricted, to use the words of an eminent German author, "to those cases in which danger from the disease outweighs danger from the remedy." When the amount of mucus is so great as to threaten death by obstruction, it may be necessary to cause vomiting for the purpose of relieving the lungs of the accumulated mucus. This should be avoided until absolutely necessary, and the mildest means possible should be used for the purpose.

SIMPLE SORE THROAT.

DIPHTHERIA.



VARICOSE ULCER.

NŒVUS.

DIPHTHERIA.

SYMPTOMS.—CATARRHAL FORM: *Slight fever; malaise; dryness in throat, with slight pain on swallowing; glands of throat swollen; mucous membrane red; small grayish-white or whitish-yellow spots; frequent nausea and vomiting.*

CROUPOUS FORM: *Symptoms of catarrhal form intensified; more fever; head hot; mind confused; much pain in throat; one or more whitish patches in throat; peculiar offensive odor of breath; tongue coated; voice husky or absent; obstructed respiration.*

MALIGNANT FORM: *Foregoing symptoms, with extreme prostration; pulse weak and slow; face sodden; neck swollen and shiny; breath very offensive; false membrane very extensive.*

This disease is of so great practical interest on account of its great and increasing prevalence at the present time that we shall be justified in devoting more space to it than to most of the other affections considered in this volume. Special attention to this disease is particularly demanded by its great fatality, its extremely infectious character, and by the important facts developed by recent researches.

Fig. 337.

The disease is by no means a modern one, as is generally supposed. Homer and Hippocrates, who wrote several centuries before the Christian era, were each familiar with this disease under the name of *Malum Ægyptiacum*. As the ancient name indicates, the disease was by early writers supposed to originate in Egypt and Syria. An epidemic of diphtheria occurred in Rome A. D. 380. Holland was visited by the disease in 1557. Many other parts of Europe

suffered from its ravages in the two last centuries. The first recorded occurrence of this affection on the American continent was in 1771, described by Samuel Bard in 1786. In 1856 another very severe epidemic visited this country, since which time it has been very common, seemingly increasing in virulence from year to year, sometimes abating its ravages for a single season, then breaking out with redoubled fury and fatality the next.

The characteristic feature of the disease when fully developed is a peculiar membranous formation which makes its appearance usually upon the fauces or tonsils, and is called *diphtheritic membrane*, from its resemblance to skin, which is the signification of the Greek word from which the name is derived.

This membrane, or rather false membrane, when first formed, is of a grayish-white color; very tough, of leathery consistency, and adheres to the mucous membrane beneath it with great tenacity, it being very difficult to tear away except in shreds, and then only by laceration of the mucous membrane, leaving a bleeding surface. The false membrane, in fact, is not formed upon the mucous membrane or other tissue where it may occur, but in it. At least it sends down numerous rootlets which are imbedded between the cells of the tissue beneath. In this respect the membrane is very different from that formed in croup, which often separates from the mucous membrane upon which it is formed, leaving the tissues entirely uninjured.

The membrane is not confined to the fauces. It may occur on any portion of the structures of the mouth, the inside of the cheeks, the gums, the tongue, the edges of the lips, as well as on the tonsils, the uvula, the soft palate, and the pharynx generally. It may also occur in the nasal cavity, either primarily or secondarily, extending upward from the fauces.

We recently treated a case in which the whole back portion of the mouth was covered with the diphtheritic membrane, which also extended throughout the nasal cavity, and even appeared at the edges of the nostrils. The exudation may also occur at any other parts of the body where there is a union between skin and mucous membrane. Even the stomach and intestines sometimes become the seat of a diphtheritic membrane.

The exact nature of this membrane has been the subject of much experimental inquiry. Besides being subjected to a most careful microscopical inquiry by hundreds of skilled microscopists in the Old

World as well as the New, eager pathologists have submitted it to the test of physiological analysis by applying it in various ways to lower animals. The results of these inquiries have seemed to establish the following facts:—

1. The active cause of the characteristic features of diphtheria is germs. The period of incubation is usually two to eight days.

2. The false membrane is formed by the growth of these vegetable parasites in and upon the infected mucous membrane, and the vital resistance of the tissues to the depredations of the organisms.

The investigations of Löffler and other bacteriologists have shown conclusively that diphtheria is a parasitic germ disease, and that it may be best treated by remedies which are capable of combating or destroying the germs and aiding the system to eliminate the poison produced by them. The disease is unquestionably contagious in character through the transmission of these germs. An attack confers upon a person immunity for a few months at least. The accompanying cuts (Fig. 338) show the appearance, under the microscope, of the germs which are commonly found in this disease.

Fig. 338.

A. The specific germ of diphtheria.
B. Pus-forming germs usually present in diphtheria.

Many interesting facts have been developed respecting the nature and causes of diphtheria within the last few years. Löffler, an eminent German bacteriologist, has devoted much attention to the study of the disease, and through his persevering labors the specific germ to which it is due has been isolated. Formerly it was difficult to distinguish, in all cases, between true diphtheria and other diseases closely resembling it. It is now possible to make an absolute diagnosis by taking from the throat of the patient a small portion of the membrane, or of the secretion adhering to the diseased surface, and cultivating it in a laboratory, determining the nature of the germs present by the usual methods of cultivation, staining, and microscopical examination.

A very interesting and important fact which has still more recently been discovered in relation to this malady, is, that diphtheria

germs are often found to be present in the throat of persons who are apparently enjoying perfect health. The germs are most often found in the little pockets which exist in enlarged and diseased tonsils. When diphtheria is prevailing in a community, it is found that diphtheria germs are often present in quite a large proportion of the well people living in the vicinity of a malignant case. This explains what was formerly a mystery,—how the disease might spread without contact of healthy individuals with the sick. The germs are evidently carried in the air. They are not found, in nature, growing outside of the body, their favored home appearing to be the human throat. The same is true of the germs of pneumonia and some other maladies.

It is thus apparent that a matter of first importance in the prevention of this disease is the maintenance of a thoroughly healthy state of the throat. Diseased tonsils are particularly active as a predisposing cause of diphtheria. The writer has met many cases in which repeated attacks of diphtheria had occurred in persons suffering from enlarged tonsils. A period when diphtheria is prevalent in a vicinity is not, however, a proper time for removal of the tonsils, as the slight temporary inflammation following the operation would constitute an excellent predisposing cause of an attack.

Another fact of interest which has been developed by recent researches in relation to this disease, is that its worst manifestations are not due to the diphtheria bacillus alone, but to its association with other germs, particularly germs which are capable of forming pus, and hence may give rise to general infection of the tissues. The fever, paralysis, and most of the other symptoms which occur in diphtheria, are not directly due to the germ by which the disease is occasioned, but to the poison produced by the germ. A person suffering from diphtheria is poisoned by the toxic substances produced by the germ, just as he might be poisoned by the introduction of the poison beneath the skin by the aid of a hypodermic syringe, or by any other means.

Another very important result of the modern researches in relation to this disease, is the demonstration of the identity of diphtheria and croup, if not in all cases, at least in a large proportion of cases. This remark does not apply, of course, to spasmodic croup, but to what is known as true croup. It is true that croup may be produced by other means than by the diphtheria germ ; strong am-

monia is capable of producing a croupous inflammation of the throat; but it is now generally conceded that true croup is, in the great majority of cases, simply diphtheria of the larynx, and is a most contagious malady. Consequently the same precaution should be taken to prevent the extension of the disease in the form of croup as when it occurs in the ordinary form.

Diphtheria may attack other parts of the body as well as the throat and larynx. It may begin in the nose instead of the throat or larynx. Some years ago the writer encountered a case in which the general symptoms of diptheria were present, but without the appearance of any membrane in the throat. On examination with a small mirror placed at the back of the throat, however, a very extensive false membrane was found developing at the back part of the nasal cavity. The patient was a lady who had suffered for years from chronic nasal disease, and was attacked in this region doubtless in consequence of the existence of raw surfaces which presented a favorable opportunity for the development of the malady.

The common custom, most prevalent among the gentler sex, of rather indiscriminate kissing, bestowing especially frequent favors of this sort upon small children, cannot but be deprecated, at least during the prevalence of a diphtheria epidemic.

When an epidemic of diphtheria is prevalent, there are many cases, especially among adults, which are so very trivial in their general symptoms that the individual considers the difficulty nothing more than a cold, when he is really suffering with diphtheria, having distinct patches in his throat, and is, unconsciously, sowing broadcast the seeds of disease wherever he goes. This fact is one which has been very little understood until recently. Doubtless a very large proportion of mild cases of diphtheria have been treated as ordinary colds or sore throats, or have received no attention at all. This is doubtless the way in which many extensive epidemics begin, the poison being very widely distributed by persons who are not sufficiently ill to think it worth while to call a physician or to remain at their homes, but who go to their vocations, mingle with friends and others at church and other public gatherings, and thus expose multitudes of persons. It is true that mild cases of this sort are not so likely to communicate the disease in its gravest form as is a malignant case, nevertheless, it not infrequently happens that malignant cases originate in cases of so mild a character as to be almost entirely overlooked.

A few other means of contagion which we do not remember having seen mentioned are perhaps worthy of attention in a practical treatise like this. The disease may unquestionably be spread very rapidly by the use of a common drinking-cup at school or elsewhere. One of the worst cases of diphtheria we ever saw was in a little child who had taken the disease from a workman employed on the premises, by sipping water from the man's drinking-cup. The man suffered but slightly; but the little boy narrowly escaped without serious injury after a very severe illness, with extensive production of the false membrane. Toys and even books may also become the medium for communicating the disease, as well as articles of clothing, and anything that may become infected by the breath or expectorations of the patient.

Predisposing Causes.—Anything which impairs the vital functions will predispose to an attack of any febrile or other disease. We do not purpose to mention here all the numerous causes of impaired vitality, but only some of those especially active in rendering the system liable to the disease under consideration.

"Taking cold" is a process very difficult to describe exactly, but is so common an occurrence that the phrase is significant to every one. In general, when a person has taken a cold there is more or less congestion and irritation, if not actual inflammation, of the mucous membrane of the pharynx, and often of the nasal cavity also. There is also usually present an increased secretion of these parts, and a tumid condition of the mucous membrane. This condition is particularly favorable, not only to the lodgment and development of the diphtheria germs, but to the development of the accompanying inflammation.

Chronic inflammation, or catarrh of the pharynx, as well as nasal catarrh, is also a powerfully predisposing cause of diphtheritic inflammation of those parts. When the mucous membrane is already affected by an inflammatory process, the presence of the diphtheria organisms is all that is required to convert the morbid process into a diphtheritic inflammation. Consequently, those who are thus suffering should be exceedingly careful to avoid any sort of exposure to infection from the disease. Persons who have been subject to pharyngeal catarrh find the difficulty increased after an attack of diphtheria.

Insanitary conditions, by impairing the vital forces, and thus diminishing the vital resistance of the tissues, will produce a strong

predisposition to diphtheria. As already shown, all sources of decay may be sources of diphtheria poisoning, so that insanitary conditions are both directly and indirectly productive of this dangerous malady. This fact is well worthy of repeated emphasis when the larynx becomes affected, while adults may suffer the same amount of infection and invasion of the throat and larynx without any serious interruption of respiration. This is one cause for the greater fatality of the disease in children.

The disease is often more prevalent in the cooler seasons of the year than in the summer, but probably this fact is wholly due to the increase of predisposing influences of other sorts at those times, as increased frequency of colds and nasal and pharyngeal catarrhs; less free circulation of air in dwelling-houses greatly increasing the virulence of the poison wherever it may chance to be at work, and similar incidental causes. The disease has been known, in many instances, to extend its ravages in certain localities as widely and as fatally during the heat of summer as at any other season of the year.

The observations compiled by Dr. H. B. Baker, Secretary of the State Board of Health of Michigan, show an increase in the frequency of the disease during July and August. This may be due to the fact that the great heat of those months encourages decomposition and the generation of germs in unusual abundance.

Certain diseases, as whooping-cough, typhoid fever, and scarlatina, are liable to be followed by diphtheria, which is then known as secondary diphtheria. Children under ten years of age show a marked susceptibility to this disease. Between the ages of two and four years the susceptibility is greatest. Children under one year of age are not likely to have the disease. Very young children seem to be almost wholly protected against it by their infancy. Children are not only the most liable to take the disease, but they are likely to suffer the most severely. Adults, except in cases of extreme old age, suffer much less from the most serious results of the disease on account of greater size of the larynx. In children the larynx is so small that suffocation is imminent.

A mild or catarrhal form of the disease is very likely to be overlooked, or regarded as only an ordinary sore throat, even by physicians. Some physicians contend that the catarrhal form of diphtheria does not exist. We would call especial attention to the fact that epidemics of diphtheria are always accompanied and followed by numerous

cases of sore throat, tonsillitis, etc. Dr. Arthur Downs, in an able article in the *American Medical Bi-Weekly*, takes the position that these affections at such times are "essentially identical with undoubted diphtheria." The reasons he gives for thus thinking are as follows:—

"1. These sore throats prevail correlatively with the unquestioned cases of diphtheria. 2. Under favorable conditions they may communicate the typical form of the disease. 3. The latter, also, in its turn, gives rise to these apparently trivial sore throats." Dr. Downs adds: "I can only repeat my conviction that, if the public generally, and medical men in particular, dropping the misleading name derived from a variable pathological appearance, would regard these concomitant 'sore throats' as essentially 'diphtheritic,' a great point would he gained toward the isolation so necessary, but at present so difficult to obtain. It is to this end that Dr. Thursfield, whose experience is second to none, strenuously urges the disuse of the modern term 'diphtheria,' and the resumption of the old name 'contagious cynanche.'"

Paralysis and Other After-Results.—Secondary affections of various sorts may follow any form of diphtheritic disease. The most common of these is paralysis. Paralysis of the soft palate and pharynx is the most frequent; but the disease may involve any part or the whole of the muscular system. This affection usually comes on after the local disease is cured, even as late as the fifth or sixth week. It usually appears in the second or third week, beginning so insidiously as to be scarcely noticeable, and gradually increasing until fully developed. The soft palate is first affected. The uvula hangs down, making it impossible to give the open sound of the vowel *a*. If the paralysis is of one side only, the uvula will be drawn over toward the healthy side. The patient finds difficulty in articulation, in swallowing, and in expectoration. The speech is thin and nasal. The sounds of syllables run into each other, being sometimes almost unintelligible. The patient will sometimes complain of liquids getting into the nasal cavity in drinking.

Paralysis of the muscles of the upper and lower extremities, of the larynx, of the face, the eye, the neck, trunk, and diaphragm, and of other parts also, occurs in many instances, especially in the more severe cases, appearing a week or two after convalescence begins.

An important fact to be recollected is that one attack of diphtheria is no protection against subsequent attacks. Indeed, a person who

has had diphtheria is often more susceptible to the poison and more liable to infection than if he had not suffered from the disease, on account of the chronic inflammation of the throat which frequently follows the disease.

Treatment.—The treatment of this disease has not usually been very satisfactory. The history of the various epidemics recorded shows a mortality of one in every two and one-half cases, or forty per cent in severe cases. In some epidemics, a rate of mortality as high as sixty and even seventy-five per cent has been reached. This makes the disease even more to be dreaded than small-pox or cholera. Even yellow fever scarcely exceeds it in fatality.

Diphtheria Antitoxine.—Within the last three or four years a new remedy for diphtheria has been introduced in Germany and France, and recently in this country, which promises, in the claims of the originators at least, to prove a panacea for diphtheria. This remedy is known as diphtheria antitoxine; it consists of the serum of horses which have been rendered proof, or immune, against diphtheria by inoculation with gradually increasing quantities of germs until a dose ordinarily fatal produces no effect. The antitoxine serum is said to be capable of both preventing and curing diphtheria. The remedy has now been extensively tried in this country as well as in France and Germany, but it must be confessed that the results have been by no means what was anticipated. The mortality is this country has not been less under the use of the diphtheria antitoxine than under simpler measures. Whether this remedy will prove to be valuable or not remains to be seen. It has some very earnest champions. The theory of the operation of this remedy is that it contains a substance which, when introduced into the body, enables the system to destroy the diphtheria poison.

Local Treatment.—As already observed, diphtheria is primarily a local disease. This being the case, its local treatment becomes a matter of the greatest consequence. Indeed, this portion of the treatment should receive first attention. This fact has been long recognized by one class of physicians, those who have believed the disease to be essentially local in character; and a great variety of remedies have been employed. Prominent among these has been the application of caustics of various sorts to the throat. Nitrate of silver, nitric acid, hydrochloric acid, iodine, caustic potash, pure carbolic acid, and va-

rious other caustics have been thus employed, but none so frequently or so extensively as the first named.

After dwelling at some length upon the evil results of cauterization, Oertel remarks as follows:—

"There can be no doubt, then, that the unfavorable results which have been obtained on all sides by cauterizations, more or less energetically practiced, must put a stop to this procedure, even if, in its stead, we should be obliged to resort to its opposite, the purely expectant and symptomatic treatment." *

Another author, eminent both as a teacher and as a practitioner of medicine, says:—

"A large proportion, if not the great majority, of the practitioners of this country have been led to discontinue the cauterizing and irritating topical applications which have been heretofore in vogue." †

"The use of a solution of nitrate of silver, and even of the solid stick, at one time met with considerable support, . . . but it is being gradually abandoned by those who have had experience of recent epidemics. . . . In fact, the profession has given up the use of caustics altogether, being convinced that they rather aggravate than check the local process." ‡

Numerous other equally eminent names might be cited as opposed to the use of caustics in this malady, among whom are Profs. Janeway and Lusk, of Bellevue Hospital Medical College, New York. We have dwelt thus lengthily upon the subject of caustic treatment because this obsolete practice is still held to by physicians who have not had a large experience in the treatment of this disease, or who have become too thoroughly fossilized to be able to modify their ideas in accordance with the most advanced information on this subject.

Disinfectants.—All agents which are destructive to germs when used in a form which will not destroy the living tissues, are useful as local applications; but the best preparations are solutions of chlorine, or of some of its compounds, permanganate of potash, and carbolic acid. Strong alcohol has proven very effective in many cases. These solutions must be used thoroughly and often as gargles. At least twice an hour the throat and mouth must be well rinsed. If the patient is too young to gargle well, or if the posterior part of the pharynx is

* "Ziemssen's Cyclopedia of Medicine," vol. i. p. 673.

† "Practice of Medicine," by Austin Flint.

‡ "Diphtheria; Its Nature and Treatment."—Mackenzie.

affected, the disinfecting lotion must be applied with a swab, syringe, or an atomizer. A swab can be easily made by tying a small soft sponge or a strip of muslin to the end of a small stick or a lead pencil. In case the nasal cavity is invaded, the solution must be passed through the nose by a syringe. The following directions for the preparation of solutions which we have found to give exceedingly satisfactory results, may be useful to the unprofessional reader :—

Chlorine Solutions.—(a) One part of a freshly prepared solution of chlorine gas, or chlorinated soda, in three to five parts of pure water, according to the strength of the solution and the sensibility of the affected parts. Keep tightly corked, and wrap the bottle in a dark cloth or paper.

(b) In a pint bottle place a teaspoonful of chlorate of potash. Drop in a half-teaspoonful of muriatic acid, cork the bottle quickly, and shake it gently in such a way as to bring the acid well in contact with the crystals. A greenish-yellow gas will appear in the bottle. After allowing the bottle to remain closed for ten or fifteen minutes, remove the stopper and pour in quickly half a teacupful of water. Stopper the bottle again immediately, and shake four or five minutes. Repeat the process until the bottle is two-thirds full. Use as strong as patient can bear without causing irritation of the mucous membrane.

(c) Dissolve in a half pint of equal quantities of vinegar and water, two heaping teaspoonfuls of common salt. Use very freely.

Permanganate of Potash, one of the most useful of all disinfectants, is a good remedy in this disease. Dissolve in a pint of pure water, in a glass vessel, one-half dram of permanganate of potash or soda. Use of full strength or with an equal quantity of water. This solution will stain clothing upon which it happens to fall, as well as the skin. The stains are easily removed, however, by a weak solution of oxalic acid. Use with a swab.

Peroxide of Hydrogen in solution, one part to four or six of water, is a remedy which has had some popularity.

Sub-sulphate of Iron, in the official solution as found at the drug-stores, is also a valuable remedy which, when applied with a swab, not only destroys the germs but protects the tissues to some extent.

If these solutions are carefully prepared and faithfully used from the outset of the disease, the results will often be very satisfactory.

They can be obtained of any druggist, and most of them can be readily prepared at home if the materials are at hand. It is important that every family should have the materials for at least one or two of the preparations constantly on hand in readiness for use without delay when occasion may require.

There is no known means by which the growth and development of germs may be more efficiently checked than by the use of cold applications which should be made to the throat externally, and the patient should be allowed to hold small bits of ice in the mouth and to swallow them occasionally. The cold applications must be made thoroughly enough to reduce the temperature of the throat as near the freezing point as the patient can endure without suffering, as otherwise it will do almost nothing toward modifying the morbid process. The best mode of accomplishing this is to apply to the throat compresses composed of several folds of linen or cotton—flannel may be used when necessary—between the folds of which are placed numerous small bits of ice or small quantities of snow. The intensity of the cold may be regulated by the quantity of ice or snow used. When the patient cannot bear so great a degree of cold, compresses may be applied wrung out of cold or iced water. The compress must be large enough to cover the throat and extend well around the sides of the neck.

To guard against too prolonged lowering of the temperature and circulation of the part affected, and to relieve pain, once an hour or two the cold compress should be removed and the throat fomented for ten or fifteen minutes.

To alleviate the suffering, and the difficulty in breathing and swallowing, and to facilitate the removal of the false membrane, no single remedy is so efficient as the inhalation of hot vapor. It is not necessary that the vapor should be medicated, although chlorine, carbolic acid, or vinegar may be added with benefit. The important thing is that the vapor should be as hot as can be borne by the patient without discomfort. A temperature of 110° to 120° will be borne without difficulty by most patients. This remedy soon affords the patient so much relief that even little children manifest a very great appreciation of it. The inhalation should be practiced once or twice an hour at first, and ten to fifteen minutes at a time. The warm vapor acts like a poultice in relieving the swelling, soreness, and spasm, and in facilitating the separation of the false membrane. In cases of croup-

ous diphtheria, especially when the larynx is involved, this remedy is almost the sole reliance for saving the patient's life.

Different modes of applying this remedy have been suggested. It is of the greatest importance that it be done thoroughly. A very good plan is to attach a rubber tube to the nose of the tea-kettle. A tin tube can be readily made by a tinner if rubber cannot be obtained. As the steam is generating, let the patient hold one end of the tube to his mouth and inhale the warm vapor as freely as he can.

Another very good plan is this: Place in an ordinary tea-pot a few good sized pieces of freshly burned lime. Pour on the lime a boiling hot mixture of vinegar and water. Close down the cover, and let the patient breathe the vapor through the nose. The lime and solution can be renewed as the quantity of vapor diminishes. This is a very good plan, if well carried out. The best of all arrangements for this object is an apparatus constructed for the purpose, a representation of which may be seen in Fig. 274. Every family ought to have an apparatus of this sort ready for use.

No attempts should ever be made to forcibly remove the membrane. If it is torn off, the mucous membrane is left sore and often raw or bare. When removed thus, another membrane is sure to form.

The removal of the membranes may be effected by the inhalation of solutions of substances which have the power to dissolve them chemically. A moderately strong solution of lime-water, or of vinegar, answers well for the purpose. An atomizing apparatus is required. In cases of diphtheria of the larynx, this is a very important measure indeed, and must be used very thoroughly.

When the membrane has ceased to form, hot fomentations should be assiduously applied to the throat in addition to the inhalation of warm vapor, which should be continuous at least fifteen minutes in each half hour.

The administration of a light emetic is often advantageous in effecting the dislodgment and expectoration of the membranes in cases in which the larynx is affected. A copious draught of lukewarm water is usually sufficient for the purpose; but if emesis does not follow its repeated use, a small dose of sirup of ipecac or a teaspoonful of powdered alum or ground mustard, or some other simple emetic, followed by warm-water drinking, will be sure to induce vomiting.

When the nasal cavity is obstructed by false membranes, thorough syringing should be resorted to, the solution consisting either of equal parts of good vinegar and warm water, or a solution of lime, five grains of freshly burned lime to the ounce of water. The syringing should be continued fifteen or twenty minutes at a time, and renewed at brief intervals.

Constant irrigation of the nasal cavity and throat with a weak solution of common salt, about one part to 200, has been used with great success in the New York Hospital for Children in the treatment of the disease. The idea of this treatment is to wash away from the throat as many of the germs as possible, and the poison they produce, thus preventing the swallowing of the poison and its absorption. The sick child is laid upon its side and the solution is allowed to run into one or the other nostril and out at the mouth. The treatment is said to be tolerated by children much more readily than might be supposed.

Powdered sulphur enjoys the reputation of being of some value in this disease. It is applied in the form of a powder and by insufflation. The form of sulphur known as sublimated sulphur is best for the purpose.

General Treatment.—For subduing the fever no remedy equals water in antiphlogistic effects. In general, the febrile action accompanying diphtheria does not rise so high as in most other febrile diseases; yet this symptom is one of no small importance. The same means should be employed as elsewhere directed for fever (page 1182).

Care must be taken continually in the use of water in this disease, that the patient has no tendency toward collapse. If the pulse begins to flag, is slow and feeble, while the skin is cool, no cooling applications are necessary, but warm applications should be used instead.

At the outset of the disease, when the patient often complains of chilly sensations, a warm blanket pack, given by wringing a woolen sheet out of water a little above blood heat, and wrapping it snugly about the patient will be found a very excellent remedy, not only for the chilliness, but also for the muscular soreness, which is also a frequent symptom at the onset of the disease.

Diarrhea, vomiting, and the other minor symptoms which often accompany this disease, are to be met by the usual remedies. For troublesome nosebleed, which not infrequently occurs when the nasal

cavity is affected, the nasal douche, employing a hot solution of chlorate of potash is the best remedy.

For sustaining the patient, too great reliance is put by many upon the large use of iron and frequent feeding. We have never seen sufficient evidence of the utility of these methods to convince us of their efficiency. Others use stimulants in great quantities, which we believe to be productive of more harm than good. What the patient needs is nutrition, not stimulation. If overcrowded with food, and plied with aliment at too frequent intervals, the nutritive apparatus will have no time for the elaboration of food, and no time for rest. It will be always engaged in the preliminary work of digestion. The overworked stomach will be sure to fail up with indigestion, and the patient will really receive a much smaller amount of available nutrition than if food is taken in proper quantities at intervals sufficiently far apart to allow time for digestion.

Give the patient three meals a day at regular hours. Let the diet consist principally of oatmeal or barley gruel, with fruit and milk toast. If there is difficulty in swallowing solid food, let the patient have plenty of milk, buttermilk, or kumyss, at intervals of three to five hours.

If the patient falls into a state of collapse, the pulse being slow and weak, the skin cool, the respirations rapid, with the other usual symptoms of that condition, the temporary use of stimulants may be useful. We have used electricity, both the galvanic and the faradic, in such conditions with excellent results. Dry heat is also a useful stimulant in such cases. All may be used in conjunction.

Paralysis, and the other secondary affections which often follow this disease, should be treated on the general principles governing the treatment of those affections from whatever cause. In the case of paralysis, after the disease is fully developed, electricity should be employed. This, with out-of-door exercise and time, will effect a cure in most cases. Tracheotomy is a surgical operation sometimes performed when the symptoms indicate imminent danger of suffocation; but before it is resorted to, the condition of the patient is already so hopeless that recovery rarely occurs.

To Prevent Contagion.— A patient suffering from diphtheria or scarlet fever should be isolated during the disease, and after death or recovery, most thorough disinfection of the sick-room, and everything in contact with the patient, should be employed. (See chapter on "Disinfectants.")

GLANDERS—FARCY.

SYMPTOMS.—High fever; chilliness; severe headache; pain in the muscles and joints; dark colored urine; profuse sweating; discharge from the nose, at first watery, then profuse, viscid, and finally greenish; eruption of the face, known as "farcy-buds," which become ulcers.

This disease is generally contracted from horses. Both the mucous membrane and the skin are affected. The term *glanders* is applied to the disease when it affects the mucous membrane, and *farcy* when it affects chiefly the skin. Red, warty growths affect the skin when it makes its appearance, which are known as farcy-buds. In horses the disease frequently affects the lungs, when it very closely imitates what is termed "heaves," the horse having a short, smothered cough, and being troubled with shortness of breath. Great care should be exercised to avoid exposure and contamination with the discharge from the nostrils of horses, whether they are known to have glanders or not. Horses that are discovered to be subject to the disease should be at once destroyed, and everything which has been used about them should be thoroughly disinfected by the burning of sulphur. The stalls, manger, harness, blanket, and everything employed about them should be thus treated.

After the system has once become thoroughly infected with this disease there is no known means by which a cure can be effected, though much can be done to palliate the patient's condition and prolong his life. Great care should of course be taken to prevent communication of the disease to others.

When a person in handling a horse suffering with glanders gets any of the matter into a crack of the skin or upon the raw surface, the same measures should be taken as have been recommended for the bite of a mad dog; that is, the parts should be cut out or cauterized, or both measures should be employed.

When the disease first makes its appearance in the nose, the nasal cavity should be washed out twice a day by means of the nasal douche, with a solution of chlorate of zinc, two to six grains to the ounce of water. A physician should be consulted as soon as the disease is suspected.

VARICELLA—CHICKEN-POX—WIND-POX.

SYMPTOMS.—Eruption; slight fever; restlessness; some itching of the skin.

This is a very mild disease. It generally occurs in epidemics, and is believed to be slightly contagious, being communicated, as is thought,

FAVUS.

SMALL-POX.

MEASLES.

SCARLET FEVER.

PLATE C.

by the breath. The first symptoms of the disease generally make their appearance about two weeks after exposure.

The first symptom, and indeed the most prominent symptom of the disease, is the eruption, which consists first of roundish or irregular and slightly raised spots, being in size from that of a pin-head to a pea. In the center of these spots are little vesicles which are filled with a colored, watery fluid. The vesicles are generally very few in number, and never have the center depressed as in small-pox. When scratched, the eruption appears in successive crops during the first two or three days. By the sixth day, the vesicles become dry and covered with small brownish scabs. The disease is distinguished from both measles and small-pox, for which it may be mistaken, by the fact that the eruption either precedes or occurs at the same time with the beginning of the fever.

Treatment.—As the disease is never fatal, the most that is required is to keep the patient quiet, and if the fever is quite high, to cool the body by tepid sponging, or compresses applied to the bowels, changed as frequently as necessary. The patient should take a very light diet for a few days.

MEASLES.

SYMPTOMS.—FIRST STAGE : ***Chilliness, followed by symptoms of catarrh of the upper air-passages ; eyes red and tearful ; hoarse and dry cough ; pain in the head and limbs ; disturbance of digestion ; nausea, and sometimes vomiting ; eyes sensitive to light ; sometimes violent sneezing.***

SECOND STAGE : ***Increase of fever ; in small children, sometimes convulsions ; appearance of eruption about the mouth and eyes, which soon extends to the neck, chest, and over the lower part of the body ; itching and tingling of the skin.***

THIRD STAGE : ***Fever and eruption nearly disappear ; spots covered with bran-like scales.***

Measles is an eruptive, contagious disease which may occur at any age, although children are most likely to be affected by it. It generally occurs in epidemics, and is infectious as well as contagious. It begins much like a severe cold or influenza. After two to four days, the eruption appears, and consists of small, slightly elevated, reddish spots. When pressed with the finger, the red coloring disappears, and the spots soon run together, forming irregular clusters which often have a quarter-moon shape. The eruption feels rough to the finger. Occasionally little vesicles or blister-like spots are seen. The disease

reaches its height upon the third day of the eruption. At the end of the fifth or sixth day, the spots become of a yellowish tinge, and there is a marked amelioration in all the symptoms. The catarrh gradually subsides, and by the end of two weeks the patient is generally well. The period of incubation, or time which elapses after exposure before the symptoms of the disease make their appearance, is about one week.

A form of the disease in which the spots are unusually dark, is known as black measles. The disease sometimes assumes a very malignant form. Complications sometimes occur, the most dangerous of which are pneumonia and bronchitis. Inflammation of the eyes is also very common, the eyes sometimes remaining sore for a long time after the patient has recovered from the disease itself. Croup is an occasional and very fatal complication. Inflammation of the bowels sometimes occurs.

Treatment.—When an epidemic of measles is prevailing, great care should be taken to prevent exposure to the disease. This cannot always be done, as the popular dread of the disease is not sufficiently great to induce the entire isolation of persons who are suffering with it. Various experiments have been made which seem to indicate that a degree of protection may be afforded by inoculation with the virus of the disease, as was practiced as a means of protection from small-pox before the discovery of vaccination. Inoculation has never been extensively practiced, however, and is of doubtful propriety.

In mild cases, very little treatment is required except such as is necessary to make the patient comfortable. Good nursing is much more important than medical treatment. If the eruption is slow in making its appearance, or is repelled after having once appeared, the patient should be given a warm blanket pack. The cold pack is most commonly used in Germany, but we have obtained equally good effects from the warm pack, and it is much more comfortable for the patient.

When the fever rises high, it should be subdued by tepid sponging, cool compresses to the abdomen, renewed as frequently as they become warm, and the cold enema. Cold packs and affusions, although in no degree dangerous, and highly recommended by many eminent physicians, are rarely required. Thomas, the eminent author of the article on measles in Ziemssen's Encyclopedia, says in reference to the treat-

ment of this disease, "At present, cool baths, packings, and extensive cold compresses are the usual means employed. The advantages of a judiciously administered cold-water treatment in measles are, that it usually affords to the patient more speedily and safely than any other anti-febrile method, a certain sense of comfort; that it is not apt to weaken or otherwise act unfavorably; and that it shortens convalescence by permitting the patient to expose himself to the fresh air sooner than under any other treatment." Care should be employed in sponging the skin not to aggravate the irritation by rubbing. In drying the patient, the skin should be patted with a soft towel instead of being rubbed.

The old-fashioned plan of keeping the patient smothered beneath heavy blankets, and constantly in a state of perspiration, is wholly unnecessary, besides rendering the patient very uncomfortable. The irritation of the skin, as well as the sensitiveness to cold, may be much relieved by inunction of the skin two or three times a day with vaseline, sweet oil, fresh butter, or any other good unguent. No fears whatever need be entertained that the eruption will be driven in by cold applications, as there is no danger whatever from the application of cold water to the surface, except in the last stages of the disease, after the eruption has disappeared. No hesitation need be felt in applying compresses and sponging to reduce the fever on account of the cough, as this will generally be found to be the best means for relief. Convulsions require warm baths. Delirium and great restlessness indicate congestion of the brain. A slight diarrhea need give no occasion for alarm. If this symptom becomes very troublesome, a cool enema should be employed two or three times a day. The occurrence of pneumonia indicates the necessity for the employment of such measures as are elsewhere recommended for that disease. If croupy symptoms appear, ice compresses should be applied to the throat. If this does not secure relief, the throat and chest should be lightly sponged with water as hot as can be borne, care being taken not to burn the skin. Hot fomentations are also useful. If severe capillary bronchitis occurs, causing greatly diminished respiration, accompanied by high fever, Ziemssen recommends the use of the cold pack, which he thus describes: "Several thicknesses of cloth wrung out of cold water are laid upon a piece of flannel of sufficient width to protect the bedclothes from becoming wet. The naked patient is then placed upon the sheets and enveloped in them. Lively kicking and scream-

ing ensue, giving depth and force to the previously superficial inspiration. By degrees the child becomes more quiet, and soon falls asleep. The cold wrappings are to be renewed every half-hour or so, until the temperature, pulse, and frequency of respiration are remarkably diminished. This is usually the case in a couple of hours."

This treatment may seem quite heroic, but it is recommended by the highest medical authority in the world. Special attention should be given to the eyes. An application of a lotion consisting of three or four grains of boracic acid to an ounce of water, half a dozen times a day is useful in combating the tendency to mucous inflammation of the eyes which accompanies this disease. Great pains should be taken to care for the ears. The inflammation of the throat not infrequently extends into the ears causing suppuration and destruction of the drum-membrane. Sometimes incurable deafness is the result. The attention of a physician should be called to the ears if the patient complains of pain in the ears or difficulty in hearing. If suppuration occurs, the ear drum should be lanced to let out the accumulated secretion. Such a puncture heals quickly. If left to rupture, recovery is very tedious, and suppuration frequently continues for years unless skillful treatment is employed.

The patient should be allowed cooling drinks as much as desired. During the disease, a simple but nutritious diet should be allowed, but stimulants of all kinds should be prohibited. Milk, fruits, and grains may be taken in sufficient quantity to satisfy the patient's appetite, but meat should be prohibited. Good ventilation of the sick-room should be maintained throughout the disease, and care should be taken to prevent, so far as possible, the contraction of the disease by those who have never had it.

After recovery, all the clothing employed about the patient, including bedding, should be thoroughly disinfected. The sick-room should first be disinfected by burning sulphur. It should afterward be thoroughly scrubbed and aired.

GERMAN MEASLES—RUBEOLA.

This disease so closely resembles the preceding that its independent existence is not fully recognized by physicians. Persons not skilled in diagnosis would certainly be unable to distinguish it from measles. It is claimed, however, that an attack of rubeola affords no

protection from measles, and *vice versa*. The treatment and general management of the disease is precisely the same as that of measles, however, and hence we need not give it further attention here.

SCARLATINA—SCARLET FEVER.

SYMPTOMS.—The disease begins with fever, lassitude, and headache; pains in the back; flushed face; coated tongue, nausea, or vomiting; in children, convulsions. On the second day, eruption appears in the form of numerous minute dots of a bright scarlet color, which rapidly run together and soon cover the whole body. At the end of five to nine days, the fever subsides, and the skin begins to peel off.

This is an intensely contagious and infectious malady. Unfortunately, this fact has not been recognized until recently, and is not now as generally known as it should be. It is certainly due to germs.

The first symptoms generally make their appearance from four to seven days after exposure. In addition to the symptoms mentioned above, one which is very characteristic pertains to the tongue, which presents what is termed a "strawberry appearance" after the white coating has begun to disappear, occasioned by the enlargement of the papillæ, causing them to project through the white coating.

The edges and tip of the tongue are usually red in all but mild cases of the disease. The throat is more or less affected with inflammation, sometimes at the beginning of the disease, at other times soon afterward. In severe cases, inflammation of the throat is the most serious symptom of the disease. The glands under the jaw become swollen and painful, and thick, tenacious mucus clogs the throat and larynx. The inflammation may often extend into the nose. Occasionally the inflamed glands suppurate. In some instances, the inflammation is so intense that it is rapidly fatal, when it is said to be malignant.

Various complications are apt to occur in this disease, among the most common and serious of which are inflammation of the ears, meningitis, pleurisy, inflammation of the bowels, inflammation of the joints, and acute inflammation of the kidneys, giving rise to dropsy, which is one of the most fatal of all the infectious diseases in very young children. The mortality frequently reaches three-fourths of all who are attacked. The chances of life increase with the age of the patient.

Treatment.—Undoubtedly the great fatality of this disease is in a large degree attributable to improper treatment or in neglecting to employ efficient measures with sufficient promptness. Mild cases require only a simple diet, thorough ventilation, the use of tepid sponge baths, cool compresses to the bowels or wet-sheet packs, and perhaps cool enemas, and other measures which have been recommended for reducing the temperature in fever, together with good nursing. If the eruption is a little slow in making its appearance, or shows a tendency to recede after it has appeared, a warm full bath and sponging of the skin with hot water or hot and cold sponging, together with warm drinks, are the measures to be employed. When the other symptoms are very severe, ice compresses should be applied to the throat if possible, and the patient should be given pieces of ice to hold in the mouth. When the breath is very foul, a solution of chlorate of potash two or three drams to the pint, or permanganate of potash half a teaspoonful to the pint of water, may be used with a swab. Carbolic acid in the proportion of a dram to a pint of warm water is also an excellent gargle. The other solutions recommended for diphtheria are also indicated in this disease when the inflammation is high, and swelling and irritation of the throat become excessive.

Rheumatic symptoms in the joints require the use of the hot pack or the warm full bath. In a majority of cases the principal danger is from the high temperature. This should be vigorously combated by means of the cold pack, tepid sponging, and other measures already indicated. The popular idea that the eruption "may be driven in" by this method of treatment is a mistaken one. The same remarks made respecting water treatment in measles are equally applicable to this disease. When dropsy occurs from inflammation of the kidneys, the same treatment should be employed as elsewhere recommended for acute nephritis. The patient should be allowed no solid food, and if there are symptoms of suppression of urine, no food at all should be allowed for twelve hours. The patient should be induced to drink as much water as possible, and the skin should be kept in a state of active prespiration by means of warm packs. The use of meat should be strictly prohibited until the symptoms of kidney disease have passed away. If vigorous treatment is employed at the very beginning of the disease, death will rarely occur, notwithstanding the serious character of this affection.

Owing to the gravity of this disease and its infectious and contagious character, the most thorough measures should be taken to secure isolation of the patient during the attack and thorough disinfection of the sick-room. No one should be allowed to see the patient during his illness except the nurses and those who are protected from the disease by having previously suffered from it. At the very beginning of the disease, window curtains, carpets, and all other articles which may afford a hiding-place for the infectious germs, must be removed from the room to be occupied by the patient. All clothes used about the patient should be disinfected by dipping them in a solution of chloride or sulphate of zinc, or should be burned. It is a good plan to keep a tub two-thirds filled with a strong disinfecting solution (see section on "Disinfection") into which cloths soiled by use about the patient may be thrown as soon as used. It should be recollected that the patient is more likely to communicate the disease during the period of desquamation, when the skin is peeling off, than at any other time, as the little particles of dead skin which float in the air about the patient will communicate the disease if inhaled.

Special attention should be given to the eyes and ears, which often suffer irreparable damage in this disease. For the eyes, use a boracic acid lotion (three grains to the ounce) two or three times a day. For pain in the ear, see page 1507.

When the patient has entirely recovered, the sick-room and everything contained in it, or which may have become infected by the contagious disease, should be disinfected by means of disinfecting lotions, and fumigations with burning sulphur or chlorine gas. Sulphur is much more convenient to use than chlorine, and is equally effective. The method of employing it is described on page 577.

ROSE RASH.

This is an eruptive fever which is characterized by a red rash, which differs from the rash of both measles and scarlet fever, although bearing a resemblance to each. The fever runs high and the throat is often very seriously affected. Some cases are followed by dropsy, like scarlatina. It is thought to be a modification of either scarlet fever or measles, but it is not yet fully decided which. It is a mild disease, and rarely fatal. The treatment should be essentially the same as recommended for measles.

CEREBRO-SPINAL MENINGITIS—SPOTTED FEVER.

SYMPTOMS.—A violent chill, or chilliness; fever; great weakness; severe headache; vomiting excited by attempting to sit up; stiffness of the neck; head often drawn backward, and back bent; drowsiness or stupor; great restlessness; face pale or congested, expressive of great suffering; sometimes entire loss of consciousness; delirium; convulsions; skin very sensitive; pain produced by the slightest motion of the limbs; eruption beginning on the face with spots like cold sores, and gradually extending to the whole body; eruption varied, some spots like flea bites, others like prickly heat or nettle stings, still others being simply red patches; bowels irregular.

This disease is infectious and probably also contagious. Much study has been bestowed upon the affection for the purpose of ascertaining its origin. It is supposed by some that the disease is caused by the use of grain affected with ergot. For further information on this point, see page 407. It generally occurs in epidemics, but isolated cases are occasionally met with. During the war it prevailed with great intensity in some parts of this country.

In some epidemics, the disease has a mild course, while in others it is rapidly fatal. The patient is generally taken down very suddenly when feeling as well as usual. Children under fifteen years of age are the most frequent victims, but all ages are subject to the disease. The predisposing causes are poor food, damp, overcrowded, badly ventilated, and filthy dwellings. The disease is often mistaken for typhoid or typhus fever, from which it sometimes can be distinguished only with great difficulty.

Treatment.—This is sometimes a very fatal malady. The mortality in various epidemics has ranged from 30 to 70 per cent. The disease in some cases continues only a few days; in others it may be prolonged for several months, in spite of all treatment. The general fever should be combated by cool compresses and sponge baths. The special indication is for the application of ice by means of ice compresses, or better, ice packs to the head, neck, and spine. This generally relieves the headache and delirium, greatly diminishing, if it does not entirely relieve, the pain and contraction in the neck and back. Some recommend that the head should be shaven in order that it may be more easily and thoroughly cooled. The cold head pour is a very valuable remedy. In case the continuous application of cold to the head produces marked symptoms of depression, as indicated by slowness of the pulse, chilliness, etc., it should be discontinued for a time, or the patient should be placed in a warm blanket pack.

This measure is an excellent means of relieving the tenderness of the flesh and joints. If these measures of treatment are faithfully carried out from the very beginning of the disease, recovery may be looked for in the great majority of cases, and such unpleasant results as inflammation of the ears, resulting in deafness, and blindness from injury to the optic nerves, may be avoided. As remarked before, it is often difficult to distinguish between this disease and typhoid fever at the beginning, and hence it is well to begin active measures as soon as the first symptoms make their appearance, even after the real nature of the disease can be made out with certainty, especially when an epidemic of the disease is prevailing. The same precautions to prevent the extension of the disease by thorough disinfection should be observed during and after the attack as have been directed in respect to scarlet fever.

SMALL-POX.

SYMPTOMS.—Chill, or repeated chilliness, followed by fever continuing till eruption appears; intense headache, and pain in the back; vomiting; tongue coated, and no appetite; offensive breath; sometimes scarlet rash on abdomen and inside of thighs; sleeplessness, sometimes delirium; at the end of the second to fourth day, eruption of small red pimples beginning on the face, neck, and wrists, then extending to the trunk and lower extremities; attended by severe burning and itching; mucous membrane of mouth and throat also show the eruption; sore throat; fever, pain in the back and nausea subside when eruption appears; the spots enlarge, and about the eighth day become filled with matter, and center becomes depressed; skin now much swollen; fever rises again; after three or four days the pustules begin to dry, and in two or three days are covered with brown scabs, which gradually loosen; severe itching.

This is one of the most dreaded of all infectious diseases. This is partly owing to the fact that it is one of the most contagious of all diseases of this class. The symptoms generally appear from ten days to two weeks after exposure. The characteristic features of the eruption are at first a shot-like feeling presented to the finger by the small red spots which appear first upon the back, breast, and arms, gradually extending to the whole body. On the second day, the points become enlarged and elevated, forming dark red papules. By the third day they become still further enlarged and filled with a milky fluid forming vesicles, which continue to enlarge for four or five days longer, becoming conical and as large as a pea. The point of the cone now becomes depressed, so that the vesicle shows a little hollow in the center and is said to be umbilicated. The fluid contained in them becomes thick and yel-

low. This is termed the suppurative stage, which is attended by a return of the fever, which generally almost entirely subsides on the appearance of the eruption. Sometimes the vesicles run together, forming large spots, when the disease is said to be confluent. This is the worst form of the disease. After recovery, most patients present a larger or smaller number of slight depressions in the skin, known as pock-marks, due to the eruption.

In the mild form of the disease known as varioloid, the fever is much less intense, the eruption generally less profuse, and the vesicles do not matterate or become pustules. In the severe form of the disease, pneumonia, bronchitis, dysentery, and hemorrhage are likely to occur in connection with the second fever, and are frequently the cause of death.

Small-pox has been known as a dreaded disease for more than a thousand years, during which time it has frequently raged with great severity in various countries. During the Middle Ages it must have been very common to have given rise to the proverb current at that time, "From small-pox and love, but few remain free."

Cause.—Small-pox is undoubtedly the result of infection of the system by a specific germ, the origin of which is still wrapped in mystery. Although it is known that the disease has existed for many centuries, it is not known how it originated, or what country is its native home. Experience with the disease has shown that bad food, uncleanly and unhygienic habits, intemperance, dissipation of all sorts, unsanitary conditions, and the crowding together of large numbers of people, greatly facilitate the propagation of the disease and increase its fatality.

During the last two decades of the last century the mortality from this disease constituted one-twelfth of the total mortality in Berlin. During the same century the mortality from small-pox amounted to 30,000 persons annually. During the seventeenth and eighteenth centuries the deaths from this disease in England amounted to one-eleventh of the total mortality. According to the eminent Dr. Curschmann, of Berlin, from whose exhaustive article in Ziemssen's Cyclopedia of Medicine we cull these facts, small-pox came to be dreaded more than the plague. The disease continued its ravages notwithstanding the most earnest efforts of the most eminent physicians to stay its progress. It even penetrated to the jungles of Africa and the wilds of North and South America, where it carried off whole tribes of savages.

Vaccination.—It was early observed that a person who had once had small-pox was not very liable to suffer from it a second time. Ex-

periments made in China and India at a very early period showed that when the disease was induced by inoculation it was much less severe than when contracted in the usual way. This led to the employment in those countries of inoculation as a means of prevention of the disease. The same practice was introduced into Europe. It never became popular, however, from the fact that death not infrequently occurred in consequence of inoculation, and it was found that the disease was as violent when communicated by those suffering from the effects of inoculation as when acquired in the usual way.

In the eighteenth century, the supposed discovery was made in various parts of the world that a disease known as cow-pox was identical with small-pox in human beings. According to Humboldt, this was known to the mountaineers of Mexico for many years before the time of Jenner. In Gloucestershire, England, there was a traditional belief that persons who had acquired cow-pox by milking cows affected with the disease were thereby protected from small-pox. This belief led Jenner to experiment with the virus of cow-pox, and his experiments resulted in the invention of vaccination as a means of protection from small-pox.

The peculiarity of small-pox in lower animals is that its manifestation is chiefly local. In the cow, the pocks, or pustules, occur almost exclusively upon the udder and teats. In horses, the disease is confined to the foot-joints. Sheep, goats, pigs, asses, dogs, and monkeys are also subject to this disease.

The evidence is very strong that the so-called small-pox of animals is really the same disease as affects human beings, but the eminent authority quoted freely admits that the facts relied upon "do not absolutely prove it." Experience does seem to show, however, that inoculation with the virus of cow-pox, or with that obtained from the same disease in other animals, will produce a disease supposed to be modified small-pox, which will to some extent exercise the same preventive influence as the real disease itself. On this point the author before mentioned says:—

"In spite of the efforts of its opponents, no unprejudiced person at the present day can any longer be in doubt as to the efficacy and eminent practical value of vaccination. In countries where it has been introduced, and in a measure systematically carried out, the number, the intensity, and the extent of small-pox epidemics have been notably diminished, and in a manner which of itself renders the idea of

mere coincidence inadmissible. In this connection nothing could be more convincing than the exceedingly interesting and graphic account which Kussmaul gives of the mortality from variola, in Sweden, during a period of one hundred years, in the latter half of which vaccination was universally practiced. Moreover, for Germany, France, and England a somewhat similar decrease in the small-pox mortality might be demonstrated. If, notwithstanding all these proofs, we for the moment entertain the supposition, improbable as it is, that this decrease in the epidemics is a matter of mere accident, it at once falls to the ground as soon as we proceed further into detail. We see, first of all, that where vaccination is regularly practiced in very early life, the mortality of children from small-pox, instead of being as enormous as amongst those not vaccinated, is almost *nil*. We notice, further, that where the vaccination of adults, as for example in the Prussian army, is performed with regularity, epidemics of the disease no longer occur. With these facts before us, the idea of mere coincidence is out of the question. The trial of vaccination in the Prussian army has conclusively demonstrated the efficacy of the measure, to test which we have only to compare the relative immunity of soldiers during great epidemics of small-pox with the mortality in classes of the same general age in the civil community where vaccination is imperfectly carried out."

Dr. Alonzo Clarke, professor of the theory and practice of medicine in the College of Physicians and Surgeons in New York City, and one of the most eminent physicians of this country, in a lecture on small-pox reported in the *Medical Record*, remarked as follows:—

"Vaccination has been generally practiced in civilized nations for seventy years; it took it about ten years to acquire general favor, since which time almost everybody has been vaccinated. And the history of the last seventy years gives us a longer duration of human life every succeeding ten years (a less number of deaths in proportion to the number living); and if everybody be vaccinated, and everybody's life be made shorter by vaccination, you observe that this is rather a singular commentary. Every ten years is marked as giving additional length to human life (diminishing the proportions of deaths every year to the number living). I know no other commentary that need be made in regard to it."

The above quotation presents a practical argument which those who oppose vaccination under any and all circumstances will find hard

to meet unless they can show that the statement respecting the length of human life is incorrect.

It is admitted by all who are in any degree conversant with the subject that vaccination is not free from disadvantages and even dangers. Experience shows very clearly that it affords immunity only for a period of eight to twelve years. It is settled beyond question that it may be the means of communicating the worst and most loathsome diseases, when humanized lymph is employed, though this evil may be wholly avoided by the use of bovine virus, or that taken direct from a calf suffering with the disease. It appears to us that in all cases in which vaccination is employed, only the latter kind of virus should be used. We have never known of any injury arising from bovine virus, and think the evidence is very clear that small-pox may be prevented in this way by vaccination.

In some countries, vaccination is made compulsory by law. This has aroused a vigorous opposition on the part of those who are opposed to the practice, and at the present time efforts are being made, especially in England and Scotland, to secure a repeal of the compulsory laws. The anti-vaccinators are not wholly unsustained in their efforts, quite a number of eminent English physicians having taken a stand in opposition to the practice. Quite recently, a petition signed by several hundred physicians was presented to the English parliament, calling for the repeal of the obnoxious laws.

It is probable that the benefits of vaccination on the one hand, and on the other its evils, have been considerably exaggerated. It may be considered as thoroughly settled, however, that vaccination with human virus, that is, with scabs or matter taken from the sore produced in persons by vaccination, should be entirely discarded, and that bovine virus alone, if any, should be employed.

Treatment.—The patient should be kept quiet in bed. Should be given but very little simple, easily digested food. He may be allowed to take cool or cold water, lemonade, etc., at pleasure. The sick-room should be well ventilated, and should be kept at a temperature of 60° or 65°. As the disease cannot be broken up or interrupted in its course by any known remedy, the thing to be aimed at in treatment is to carry the patient safely through the ordeal, and to aid nature in the process of eliminating the poison with which the system is struggling. The high fever which occurs previous to the eruption, should be relieved by means of large cool compresses laid upon the body, and changed as often as they

become warm, together with cool sponging. The wet-sheet pack renewed every fifteen or twenty minutes until the fever is lessened, is a very efficient remedy. When the face is flushed and the headache severe, ice compresses or ice-bags should be applied to the head. If there is much vomiting and retching, the patient should swallow small bits of ice. Ice compresses should also be applied about the neck when the throat symptoms are severe.

The burning and itching of the eruption is best allayed by means of cold compresses, which should be changed as often as they become warm. If the odor is very bad, a lotion composed of an ounce of carbolic acid, one-half pint of glycerine, and two pints of water, may be applied two or three times a day. The solution should be well shaken each time before it is used. It has the effect not only of correcting the bad odor, but also to allay itching of the skin. Frequent inunction of the whole body with vaseline or sweet oil should be practiced once or twice a day. Ichthyol may be advantageously used.

When the scabs are formed, and are coming off, the patient should take a warm bath twice a day. Various plans have been adopted for the purpose of preventing "pitting." One of the most common, and probably quite as effective as any, is that invented by the ancient Arabian physicians, which consists in letting out the contents of each pustule by a fine needle passed under the skin a little ways from the edge of each vesicle. Touching the pustules once or twice a day with tincture of iodine is also well recommended as a means for preventing pitting. Another remedy recommended by some physicians is keeping the patient in the dark; but this plan is not a good one, as the deprivation of sunlight has a bad effect upon the course of the disease. Keeping the face covered with cotton well soaked in carron oil, a mixture of equal parts of olive oil and lime water, is also an excellent measure to prevent pitting; but the mixture has a bad odor, and is gummy and disagreeable. Covering the face with a thick layer of starch paste is excellent for the same purpose. None of these plans are entirely successful, however, and simple inunction of the skin, and the continuous application of the cold compresses, are probably as effective as any measures which can be employed. Adding a little soda to the water in which the patient is bathed, will facilitate the separation of the hard crusts which form near the conclusion of the disease. Painting with ichthyol may prevent pitting.

The old-fashioned sweating process in which the patient was smothered beneath heavy blankets, and kept in a highly heated apartment de-

prived of fresh air, and still further heated by stimulating drinks, cannot be too strongly condemned. This method of treatment is a relic of the Dark Ages. There are no grounds whatever for fear that the eruption will be driven in by the proper application of water, even at quite a low temperature. Care should be taken, however, that the patient is not exposed to drafts, although there is much less danger of taking cold even from this source than is generally supposed.

Some years ago we saw an account of a patient who became delirious while undergoing treatment by the old-fashioned method, and while the attendant was absent for a few moments, threw himself out of the window into a snow-bank, where he was found by the attendant upon his return. The result, instead of being disastrous as might have been supposed would be the case, was in the highest degree favorable; the exposure to cold having the effect to diminish the fever in such a degree that the patient pretty soon became conscious, and made a good recovery.

Twenty years ago, when practicing in connection with one of the dispensaries in New York City, we had ample opportunity for observing the tenacity with which the ignorant classes cling to the old idea that fresh air is fatal to small-pox. In one case, we found a little boy suffering with the worst form of the disease, lying in a crib unconscious, dressed in the same clothing in which he had been taken sick four or five days previous, and almost stifled with the foul and heated atmosphere of the unventilated room. Notwithstanding our most earnest appeals for fresh air for the little patient, the parents insisted on keeping the windows and doors tightly closed. The little fellow survived, notwithstanding, but that he did not die was certainly not due to the efforts of his parents in his behalf.

COMPARATIVE TABLE OF ERUPTIVE FEVERS.

NAME.	PERIOD OF INCUBATION.	DAY OF ERUPTION.	CHARACTER OF ERUPTION.	RASH FADES.	FEVER.	DURATION.
Measles	7-14 Days.	4th Day.	Small red spots, in quarter-moon shaped clusters.	7th to 9th Day.	Moderate, increased by eruption. No secondary fever.	6-10 Days.
Chicken-pox . .	4 Days.	2d Day.	Small pimples which become vesicles.	Scabs form 4th Day.	Very slight.	6 or 7 Days.
Scarlet Fever .	1-14 Days.	2d Day.	Bright scarlet, diffuse, in large spots or uniform.	5th Day.	Very high, continues through eruption.	8-10 Days.
Small-pox . . .	1-3 Weeks.	3d Day.	Small red pimples, which become vesicles and then pustules.	Scabs form 9th to 10th day; fall off at end of two weeks.	Very high at first; relieved when eruption appears; fever reappears on eighth day.	2-3 Weeks.

MALARIAL DISEASES.

Nearly all parts of the temperate and torrid zones are subject to some form of malarial disease. There is probably little doubt in the minds of any great number of intelligent physicians at the present day, that the cause of this class of affections is a minute animal parasite. Malarial diseases occur with the greatest frequency in the vicinity of marshes and lands subject to overflow, as borders of lakes, low lands adjoining rivers, etc. This fact is one which has been observed from the most ancient times. The danger from these sources exists not while the soil is submerged, but while it is drying up. A great increase of frequency in the occurrence of malarial disease has also been observed to result from the breaking up of new land, and especially from the exposure of what is termed "made land," in digging trenches for the purpose of laying water pipes, etc., in cities. In New York City, a large portion of which is built upon low marshy land which has been filled up since the city has been improved, it has been frequently observed that malarial diseases of various sorts quickly make their appearance upon streets in which deep trenches are being dug for the purpose of laying water and gas pipes. It would be a mistake to suppose that low marshy districts are the only ones affected. For some reason not well understood, certain localities which lie at quite high altitudes are also subject to malaria. For example, it is met with in the Apennines at a height of 1,100 feet, in the Pyrenees at an altitude of 5,000 feet, in the island of Ceylon, more than 6,000 feet above the level of the sea, and in Peru, at a height of 10,000 feet. It is found upon the high bluffs of Gibraltar, as well as on the low plains of Italy.

Not infrequently an individual may be exposed for months or even years to malaria without the appearance of any of the characteristic symptoms of malarial poisoning until the attack is excited by unusual fatigue, taking cold, exposure to fog or night air unusually heavily laden with the poison, or some similar cause. Experience seems to show that exposure to the poison when the stomach is

empty, especially early in the morning or evening, is very likely to occasion an attack. Sleeping in damp beds, living in basements or cellars, or in houses densely shaded by tall trees, may render the system susceptible to the poison, and thus occasion an attack. There is also reason for thinking that the disease may be communicated through water. The author of the article on malarial disease in Ziemssen's Encyclopedia, reports a case in which a body of soldiers who filled their canteens from a marshy district before embarking on a voyage, all suffered symptoms of malarial poisoning soon after drinking the water, the only ones of their number who escaped being the few who purchased water from the sailors, none of whom were attacked.

What is Malaria?—This is a question which has been very much discussed within the last quarter of a century. That the disease is due to parasites has long been suspected. An Ohio physician, a number of years ago, announced that he had discovered the disease to be due to infusoria, but this theory was soon exploded. Later, Klebs, of Prague, announced that the disease was due to small vegetable organisms, known as bacilli; but the more extended researches of Laveran, an eminent French physician, while a resident in Algeria, demonstrated the disease to be due to animal parasites which invade the blood and destroy the red blood corpuscles. How they obtain access to the blood, whether through the lungs or through the stomach, has not, perhaps, been fully shown; but a number of observers of the disease in such notoriously malarial regions as the Gold Coast of Africa, have noted the fact that malarial attacks are generally preceded by impaired digestion. This suggests the idea that the parasitic organisms are received through the stomach, and that they find entrance to the blood by reason of the impaired ability of the stomach to protect the body by destroying the parasitic organisms which enter it.

Of course it is possible that organisms may be introduced into the stomach otherwise than by water. They might be received through infected air, by enlodgment of the parasites in the mouth, being afterward swallowed into the stomach with the saliva. The various phenomena of the disease, chills, fever, etc., are found to follow exactly the development of the parasites, which can be watched in the blood by examinations from hour to hour during a malarial paroxysm. Numerous observations of this sort have been published, and have thrown great light upon the disease. The parasites are able

to survive in the blood for a long time in certain cases, and are liable to precipitate a new attack at any time that they develop in sufficient numbers to overcome the resistance of the body to their action. Experiments conducted by the writer in the Physiological Laboratory of the Battle Creek Sanitarium, in 1894, showed that the parasites produced in the blood a poisonous substance which is doubtless the cause of the chill and fever. It is, hence, clear that in the treatment of this disease, elimination is one of the most important measures.

Different forms of the disease are supposed by some to be due to different species of parasites. Others find a different explanation of the various modifications of the disease in different cases, and in the same case at different times.

An important fact which ought to be more generally known than it is, is that malarial disease may sometimes assume the continued type, and in these cases the patient sometimes develops a typhoid state, so that the disease closely resembles typhoid fever, and, indeed, can in no way be distinguished from the latter disease, except by an examination of the blood by an expert.

Malarial Parasites.—It is now pretty generally settled that malaria is a parasitic disease. The parasites which affect the patient suffering from malarial disease, either acute or chronic, are not vegetable in character, like the germs which are the cause of most infectious maladies, but are said to be, by their discoverer, of animal character. It has been pretty generally settled that these parasites generate in the soil of various regions, and thence find access to the human body. Contrary to the generally received opinion, malaria is doubtless, in a great majority of cases, propagated by drinking impure water or water contaminated with malarial parasites. Many cases might be cited as evidence of this. It is possible also that through the influence of fogs, parasites may be lifted into the air, and thus taken into the system by inhalation. When received into the body, these parasites prey upon the red corpuscles, which they destroy and break up. In this way the red corpuscles may be rapidly decreased in the blood, producing anemia. The accompanying cut is a representation of the microscopic appearance of malarial parasites.

The effects of malarial poison, whatever it may be, are far more serious than is generally supposed. When a person has been long exposed to the influence of malaria, a sort of tolerance on the part

of the system may be established, so that active symptoms of malarial poisoning may not appear, though the mischief is still active.

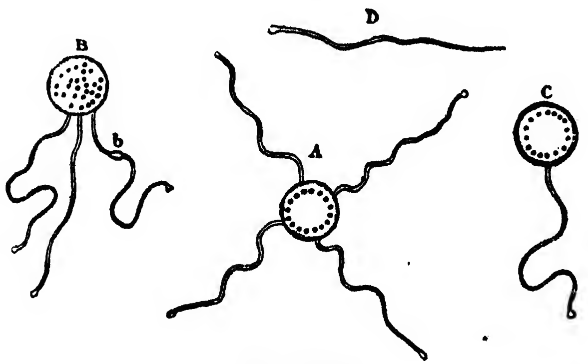


Fig. 338½.

A. Body No. 1, presenting four mobile filaments. B. Body No. 2, presenting three mobile filaments, one of the filaments presenting a small enlargement (b) toward its central portion. The pigment grains are mobile. C. Body No. 2 with a single mobile filament. D. Free mobile filament. (Enlarged 1000 diameters.)

Chronic malarial poisoning is a very common condition in malarial districts. It is indicated by a peculiar sallow complexion, general debility, dyspepsia, enlargement of the liver and spleen, mental depression, and various other disturbances of the system.

Protection against Malaria.—Malarial germs probably reach the blood through the stomach. A healthy stomach is able to destroy germs of all sorts, hence the best protection from malaria is the boiling of all drinking water, and the maintenance of sound digestion and purity of blood by an aseptic dietary (see Appendix).

INTERMITTENT FEVER—AGUE-CHILLS AND FEVER.

SYMPTOMS.—COLD STAGE: *Yawning; stretching of the limbs; headache; nausea, and perhaps vomiting; nails blue; goose-flesh; thirst; shivering, or violent shaking; back-ache; pain in the calves of the legs; the chill lasts thirty minutes to three or four hours.*

HOT STAGE: *Fever comes on gradually; headache increased; skin hot; lasts three to twelve hours.*

SWEATING STAGE: *The fever is followed by copious perspiration, during which headache and other symptoms subside; the patient goes to sleep and wakes up feeling quite well, and remains so until the next attack.*

This is one of the most common of all the forms of malarial disease. The above symptoms may be varied more or less in different cases. For example, the chill may be lacking entirely, or it may be replaced by other nervous symptoms, as convulsions. This is most likely to occur in children. Cases in which the characteristic symptoms of the chill are not marked, are sometimes termed "dumb ague." Several varieties of

ague are described, according to the length of time between the paroxysms. When the patient suffers a daily attack, the disease is called *quotidian*. The form in which it occurs every other day is known as the *tertian* type. When the chill occurs every fourth day it is said to be of the *quartan* type. Cases occur which come on the fifth, sixth, and even the thirtieth day. Occasionally, double types occur. A person suffering with the double quotidian type has a paroxysm twice a day. In the double tertian type, the paroxysm may occur twice in the same day, or the two sets of paroxysms may occur on different days, when we have an imitation of the quotidian form. The quartan variety, or "four-day ague," as it is sometimes termed, is often quite difficult to cure. The paroxysms may occur at a regular hour on stated days, or an earlier or later hour. The chill nearly always occurs in the forenoon, or sometime between midnight and noon. The most obstinate form of the disease is that in which the paroxysms occur with great regularity.

Among other symptoms may be noted a muddy complexion, coated tongue, often yellowish dinginess of the white of the eyes, enlargement of the spleen, and tenderness of the spleen and liver. When the spleen becomes greatly enlarged, as is often the case with chronic malarial affections, it is known as "ague-cake."

Treatment.—When possible, the patient should remove to a non-malarious locality. This is particularly important in severe cases, because one attack does not insure a person against a second, but rather increases the liability. In selecting a residence, care should be taken to avoid settling in a malarious locality. The popular remedy for malarial diseases of all kinds is quinine. The efficacy of this drug in checking the paroxysms of ague is undoubted. When given in sufficient quantity, the disease may be interrupted in almost every case. Unfortunately, however, the drug does not seem to possess the power to neutralize the poison, since the paroxsyms often show an obstinate tendency to return when interrupted in this way without further treatment. In order to effect a permanent cure, it is necessary that the patient should be subjected to thorough eliminative treatment. Packs, hot-water baths, vapor baths, and Turkish and Russian baths, are the best for this purpose. When these are first employed, the paroxysms can be interrupted by the use of a very small dose of quinine, when a very large one would otherwise have been required; and if the eliminative treatment is continued for a time, the disease is much less likely to return.

Although quinine is supposed to be the great specific for malaria and almost indispensable for the successful treatment of the disease, we have repeatedly demonstrated the fact that the disease is curable without it, and in fact without any drug whatever. Our usual plan of treating ague is this: If a patient comes to us suffering with chills every other day, having already passed through his regular paroxysm, we begin treatment with a wet-sheet pack about five or six o'clock in the afternoon. The patient is kept in the pack an hour, and is allowed to sweat profusely. The pack is followed by a wet-sheet rub, after which a thorough fomentation is applied over the liver, spleen, and bowels. A copious enema is administered if the bowels are constipated, and the patient is put to bed with a wet girdle about him. The next day the hot-air or vapor bath is administered about ten o'clock A. M., being followed by another wet-sheet rub and a fomentation over the liver. In the evening, a wet-sheet pack with a fomentation is again administered and the patient is put to bed without the abdominal girdle, well wrapped in woolen sheets and wearing a woolen night-dress. Having ascertained the time at which the next chill will occur, the attendant should be on hand at least two hours before the paroxysm is expected to begin, so as to be ready in case any irregularity should occur. The patient is now carefully observed, his temperature being taken every half-hour with the thermometer. The first indication of the approach of the chill is a slight rise in temperature. Instead of being 98½° it will be 99° or 100°; and as the time approaches for the paroxysm to begin, the temperature rises to 100½°, 101°, or even higher. When the attendant finds his temperature rising, he uses the thermometer every fifteen minutes, and if he finds it rising quite rapidly he knows that the chill may be expected very soon, and at once begins vigorous efforts to forestall it. Having previously got in readiness six or eight bottles filled with hot water, or an equal number of hot bricks, hot sand bags, or other means for applying dry heat, he promptly brings these into requisition, placing a hot jug or brick at the patient's stomach, two at his back, others at his feet, the sides of the limbs, at the hands, etc. The blankets are carefully tucked about his shoulders, extra covering is put on, and he is allowed to drink freely of hot drinks of some kind. We never advise ginger or pepper tea, as they are irritating to the stomach. In nine cases out of ten, the result of this procedure will be to convert the impending chill into a vigorous sweat. This can be accomplished in nearly every case when the patient has had the proper preliminary treatment, and when

the treatment is properly managed. It is necessary to exercise some care in its use however. It is important to get the patient to sweating just about the time when the chill would have begun. It is also necessary to use great care that the patient is not kept in the dry pack too long, since there is usually some fever even if the chill is escaped.

As soon as it is apparent that all danger of chilling is past, which will not be for an hour and a half to two hours at least, the patient should be wiped with dry, warm flannels, under the bedclothes, without exposing him to the air, and the hot jugs or bricks should be one by one removed and the extra covering gradually taken off, and thus he should be by degrees cooled off. A very slight exposure at this time, or drinking cold water, will bring on the chill. In some cases, a very slight chill will occur even in spite of these precautions, but one or two repetitions of the dry pack will almost invariably succeed. When we have been able to carry out this plan of treatment thoroughly, we have rarely failed in effecting a cure, even without the use of any other remedies. One fall we treated thirty or forty cases of malarial fever, and succeeded in effecting a cure in every case without other remedies than the eliminative treatment and the dry pack. Treatment must be vigorous and thorough.

The success of this plan of treating the disease depends upon the elimination of the poison from the system through the skin. The method of elimination for which nature manifests a decided preference is indicated by the profuse perspiration to which the disease is subject. If the eliminative treatment is continued until the brown coating disappears from the tongue, the disagreeable taste from the mouth, the dingy hue from the white of the eye, and the peculiar sallowness from the skin, the dry pack will be almost certainly successful. In fact, we believe that any measure which will interrupt the paroxysm may be considered as curative after proper eliminative treatment has removed the greater part of the malarial poison from the system.

From observation and careful study of quite a large number of cases, we have come to the conclusion that it is possible for the paroxysm to be fastened upon the system as a habit, so that it may continue long after the poison by which it was first excited has been eliminated from the body. When this is the case, anything which will interrupt the periodicity or regularity of the paroxysm will effect a cure. The same principles are illustrated in the treatment of other diseases; for example, holding the breath to stop hiccough, and practicing gymnas-

tics to relieve St. Vitus's dance. We have often known persons to be cured of ague by the adoption of some peculiar mode of treatment, such as going down stairs on the hands and knees head foremost, and similar apparently absurd measures. We knew of a case in which a man cured his daughter of ague by burying her in the ground, leaving only the head uncovered, for three hours, at about the time when the chill was expected. Another illustration of the effects of habit upon the system is in the frequency with which relapses occur months or even years after a person has removed from a malarious district, and has apparently entirely recovered from the effects of malarial poisoning.

These relapses can always be traced to taking cold or some indiscretion which occasions a slight fever, the occurrence of which is sufficient provocation to develop the tendency to periodicity existing in the system. We have long entertained serious doubts whether this form of intermittent fever is really malarial in character except in the sense that it is due to a habit impressed upon the system by previous malarial influences. Cases of this kind are always very mild, and yield promptly to the use of the dry pack.

Treatment during the Paroxysm.—The dry pack is also the best measure to diminish the severity of the chill during the paroxysm. Care should be taken not to keep the patient heated up too long, as otherwise the fever may be greatly increased in intensity. In one case, which we had under observation, the patient fell asleep in the chill, and the nurse neglected to remove the hot bricks by which he was surrounded, so that when he was aroused, after a short time, it was discovered that he had become delirious. The withdrawal of the hot bricks, and employment of cold applications to the head, and cold sponging, soon reduced the heat and relieved the delirium, however, and the patient made a good recovery.

After the fever is fully established, so that the patient has ceased to complain of chilly sensations, the amount of covering should be gradually diminished; and when the fever has reached its height, tepid sponge baths or a wet-hand rubbing should be repeated every few minutes, while the head is kept cool by cloths wrung out of cold or ice water. Care should be taken not to begin sponging too soon, or to cool the patient too rapidly, as the chill may return. During the sweating stage the patient should be wiped off with dry flannels; and

at its conclusion, the wet clothing should be exchanged for clean and dry garments, and a tepid sponge bath should be administered.

Cold affusions and the application of ice to the spine have been recommended as means of interrupting the chill. We consider these as harsh measures, and never employ them. In fact, about all the treatment that is of any benefit during the paroxysm is such as will render the patient more comfortable at the time. Nausea may be relieved by hot drinks during the cold stage, and sips of cold water or bits of ice during the hot stage. If the patient has eaten a meal just before the beginning of the chill, it is generally best, when there is very much nausea, to assist him to empty his stomach by giving a warm water emetic.

The diet of an ague patient should be very plain and simple. Butter, meat, sugar, rich sauces, and all kinds of pastry, should be entirely avoided. The diet should consist almost entirely of such food as oatmeal gruel, graham or Indian-meal gruel, rice, baked apples, stewed prunes, figs, and grapes. This diet should be continued until the tongue clears off, and then the patient should return to his usual diet very slowly. The free use of lemons is generally advantageous, though, as a general rule, patients become tired of them after using them freely for three or four days. As before remarked, the disease may be successfully treated without the use of quinine or any other drug, yet many cases occur in which small doses of quinine, chinoidine, or some other preparation of Peruvian bark, may be advantageously employed. We have no faith in the popular notion that it is better to allow the disease to "wear itself out." In many cases the patient becomes worn out instead of the disease. Consumption and various other constitutional disorders may arise from the long continuance of ague or any other severe malarial affection. If the disease does not yield within a week to the measures before described, it will invariably yield to a very small dose of quinine, or double the quantity of chinoidine. We rarely find it necessary to use more than four to six grains of either. After the patient has had a week's course of treatment, as before described, the remedy should be taken during the sweating stage at the conclusion of the paroxysm, or four or five hours before the time the next paroxysm is expected. Although we think it best that the use of quinine should be avoided so far as it can be, on account of its disturbing effect upon the digestive organs, we do not think there is ground for the popular belief that it injures the

bones or very frequently gives rise to permanent or serious injury of any sort. There is, however, some ground for the belief that cases of deafness are occasionally produced by its use in large doses.

Whenever its employment is thought necessary to interrupt the paroxysms of ague, it should not be relied upon as a curative measure, but should be followed by thorough eliminative treatment, such as packs, full baths, hot-air baths, and fomentations over the liver and spleen. Daily fomentations over the liver should be continued for several weeks, if necessary. In case the spleen and liver are considerably congested and enlarged, as indicated by pain and tenderness on pressure in the region of these organs, local hot and cold applications should be employed daily until the symptoms disappear, and the patient should wear for several weeks a moist abdominal bandage at night, replacing it by a dry flannel during the day. In bad cases, the moist bandage should be worn night and day, being discontinued during the daytime as soon as evidences of irritation of the skin make their appearance.

AGUE-CAKE.

What is known as ague-cake consists of an enlargement of the spleen, which is one of the results of chronic malarial poisoning. The spleen is also enlarged in typhoid fever, typhus fever, and various other febrile affections. When a person has been long exposed to the influence of malaria, the spleen frequently becomes so greatly enlarged that it can be felt beneath the lower ribs on the left side. In some cases, enormous enlargement occurs, the organ becoming fifteen or twenty times its natural size. The result of enlargement of the spleen is, in some cases, a condition which has been previously described as lukæmia, a condition in which there is a very great increase in the number of white blood corpuscles, more or less pain and tenderness which is increased on taking a deep breath, on coughing, sneezing, or producing pressure over the organ, and an unpleasant feeling of weight in the left side in consequence of the enlargement of the spleen.

Enlargement or congestion of the liver also generally exists in these cases, as indicated by symptoms on the right side similar to those already described.

Treatment.—Mosler, Hartz, and other eminent European physicians recommend very highly the use of the cold douche over the region

of the spleen, applied from one to three minutes daily. Dry packs are also a favorite and a very successful remedy in Germany. In India, the disease is frequently treated by means of puncturing with long needles. The treatment is said to be successful. Our plan of treatment is the alternate hot and cold spray or douche, applied over the spleen, general derivative baths, as packs and hot-water baths employed two or three times a week, and the local use of electricity. When electricity is used, the two poles should be applied over the spleen in such a way as to pass the current through it. Enlargement of the spleen is said to be curable by the use of the various preparations of Peruvian bark. A remedy to which attention has been more recently called, is the use of the milky juice of the unripe fruit of the pawpaw tree. A teaspoonful of the juice is mixed with sugar and divided into three parts, which are taken at equal intervals during the day. Electricity used in the manner described is very highly recommended by eminent Austrian physicians, and we consider it of great value.

PERNICIOUS INTERMITTENT FEVER—CONGESTIVE CHILLS.

SYMPTOMS.—Chill longer and harder than usual; convulsions; epilepsy; tetanus; symptoms resembling hydrophobia or delirium, followed by stupor ending with sweat; coldness after sweating stage; hemorrhage from bowels; congestion of the lungs; pneumonia; pleurisy; symptoms resembling those of cholera; jaundice.

Pernicious intermittent fever appears in a variety of forms, most of the symptoms of which are included in the above list, though all are not found in any one case. The paroxysm may occur suddenly, without warning, or may be preceded by one or more paroxysms of the usual character, or may be gradually developed, the symptoms becoming more severe with each successive paroxysm. The disease is most frequent in the Southern States and in hot countries. According to Dr. Drake, it has prevailed at various times along the southern shore of Lake Michigan, between Chicago and the mouth of the St. Joseph River, and at various points on the shores of Lakes Erie and Huron.

Treatment.—This is a very dangerous malady, and requires prompt and vigorous treatment. The same measures which have been prescribed for ordinary intermittent fever should be employed, but with still greater vigor. During the chill, the most energetic measures should be employed to excite action in the surface of the body by hot and dry applications and vigorous rubbing of the skin with hot flannels. The inhala-

tion of a few drops of chloroform or nitrite of amyl we have found effective in interrupting a congestive chill. *Pilocarpin*, a remedy which possesses the power of producing copious perspiration, is also useful for the same purpose. Symptoms relating to the stomach and bowels should be treated as when the same symptoms occur under other circumstances. Ice and a cold compress should be applied to the head with great thoroughness, and ice should also be applied to the spine as soon as the chilly sensations have passed away. Some recommend the application of ice to the spine during the chill, and there is no doubt that good may be accomplished by this measure if properly used. If employed, care should be taken to confine the application to a narrow strip just over the spinal column. There is less danger of chilling the patient than is generally supposed if this precaution is observed.

After the attack, everything should be done to fortify the patient against a succeeding paroxysm, which is very likely to be more severe than the first, if it occurs. When possible, a physician should be called in. A full dose of quinine will diminish the liability of a second attack, and may thus be of benefit. The same precaution should be observed to prevent the occurrence of another paroxysm as has been described in the treatment of ordinary intermittent fever, for preventing the chill.

REMITTENT, OR CONTINUED MALARIAL FEVER.

***SYMPTOMS.—** Chill followed by fever and sweating; no complete intermission; all the other symptoms of ague or intermittent fever are present; sometimes jaundice; remittent fever may either follow, or terminate in, ague.*

The principal distinction between this disease and intermittent fever is the fact that in remittent fever there is no complete intermission in which the patient is entirely free from fever. At the commencement of the attack the remission is generally quite marked, sometimes lasting a few hours and occasionally extending to one or two days, often corresponding exactly to the intermission in ague. After a few days the fever generally becomes continuous.

Remittent fever may generally be distinguished from typhoid fever by the fact that the temperature is usually the highest in the morning, the opposite of which is true in typhoid and typhus fevers.

Typho-Malarial Fever.— Remittent fever may be complicated with typhoid fever, constituting a disease known as typho-malarial fever. When typhoid fever occurs in malarious districts, it is very likely to be

complicated with malarial. In these cases, either element may be the predominating one.

Typho-malarial fever is not, as many suppose, malarial fever in which the typhoid condition occurs, but an actual union of the two diseases. Under the name of "camp fever," typhoid-malarial fever was very prevalent in some portions of the army during the war. This form of fever is much more grave than either simple malarial or typhoid fever. It is distinguished from either remittent or typhoid, by the fact that it presents a mixture of the symptoms characteristic of each.

Treatment.—The treatment of this disease consists in the employment of packs, full baths, hot-air baths, and other vigorous eliminative measures.

The wet-sheet pack is really one of the most valuable remedies which can be used in this class of diseases. It may be administered either during the fever or during the remission. The object of its employment during the fever, is for the purpose of reducing the temperature. During the remission, it may be used as an eliminative. The hot-air or vapor bath should be used during the remission. When the fever is high, the patient should be sponged frequently with tepid water, and tepid compresses changed as frequently as necessary should be applied to the abdomen. Constipation of the bowels may be relieved by daily enemas. When the fever is high, cold enemas, retained as long as possible, may be employed with advantage. The same directions respecting diet, medicine, etc., which have been given in describing treatment for intermittent fever, should be followed in the treatment of this disease.

MASKED INTERMITTENTS.

Persons living in malarious countries often suffer from obscure difficulties, the cause of which may be usually mistaken for some other than the real one. In many cases it will be found that the real cause of a large number of peculiar affections, especially functional disturbances of the nervous system, is chronic malarial poisoning. One of the most frequent diseases produced by malaria is neuralgia, which most often affects the face. The intercostal and sciatic nerves are also frequently affected. Occasionally the heart is the seat of the neuralgic pain, in which case the patient suffers with very severe attacks of palpitation, difficulty in breathing, accompanied by a severe pain affecting the left side and extending down the left arm.

In these attacks, the skin is generally cold and the patient may become unconscious. Paralysis of sensation, loss of hearing or speech, and other nervous disturbances may be produced by malaria. Sleeplessness at night and drowsiness during the day-time are other symptoms of chronic malarial poisoning. Jaundice, arising from an inactive condition of the liver produced by the poisonous influence of malaria, is very frequent.

Enlargement of the spleen, which almost always results from repeated attacks of malarial disease, sometimes gives rise to a peculiar coloration of all the internal organs. In a case of this kind, the condition of which we had the opportunity of examining, *post-mortem*, the brain was so deeply colored as to present a purplish appearance. When due to malaria, these affections are generally periodical in character. For example, malarial neuralgia will be likely to occur at a regular hour each day, as does the chill in ague.

Treatment.—The only cure for this class of affections is elimination of the malarial poison from the system. Sometimes the patient is too weak to bear sufficiently vigorous treatment. In this case the employment of quinine is advisable. In some cases, the disease seems to resist all ordinary remedies, so long as the patient remains in a malarial locality, and it then becomes necessary to advise him to remove to a less malarious location. Fomentations, electricity, massage, and such other measures as are elsewhere recommended for the various conditions included under this head when produced from other causes, are equally applicable as means of palliation or of aiding in recovery.

DISEASES OF THE SKIN AND HAIR.

The anatomy, physiology, and general hygiene of the skin have been considered in the first part of this work, and hence space need not be devoted to this part of the subject in this connection.

Many popular errors are prevalent respecting diseases of the skin, which originated at a time when the diseases of this portion of the body were very little understood. Modern investigations in this branch of medicine, through the aid of the microscope, have brought to light many interesting facts which explain much that was formerly very obscure. Among the numerous popular errors with reference to this class of diseases, one of the most common is the idea that all eruptions of the skin indicate an impure state of the blood. While it is true that many diseases arise from morbid conditions of the blood, this is by no means universally the case; in fact, the majority of skin diseases are distinctly local in character. The skin is not affected by morbid conditions of the blood more frequently than are the liver kidneys, lungs, nervous system, and other parts of the body. Another error which prevails very extensively, is the idea that internal maladies of a serious character are likely to occur from the "striking in" of eruptions of the skin. We have frequently been asked by patients suffering from troublesome eruptions, whether it would be safe to cure the disease, the impression being that the eruption would occur upon the mucous membrane of the stomach, bowels, or lungs, or that some serious internal malady would be developed. The opinion of those who have had the largest experience in the treatment of skin diseases is decidedly opposed to this theory; and it is probable that there is no more reason for thinking that an internal malady might be developed by curing a disease of the skin, than the contrary; namely, that disease of the skin might result from curing some internal disorder. It is probable that in most, if not all, of the instances in which internal disease seems to result from disorders or eruptions of the skin, the relation of the two is wholly due to coincidence.

Causes.—The skin is by no means so simple an organ as it appears, being, in fact, composed of *several sets of organs closely* combined.

From its complicated structure, and its location upon the exterior of the body, the skin is very liable to injury from the influence of external irritants of various sorts, such as friction from clothing or scratching; the the extremes of heat and cold; the action of acids or alkalies; various vegetable irritants, as vegetable and animal parasites. Persons engaged in certain trades, as brick-layers, masons, millers, bakers, cooks, washerwomen, etc., are liable to particular forms of skin disease, originating from the action of various irritants produced by these occupations.

Next in importance as a cause of skin disease, should be mentioned errors in diet. Indigestion is indeed a very frequent accompaniment of skin disease; and in a large number of cases, it is possible to trace the causative relation. The use of pastry, the excessive use of fats and sugar, fried food, condiments, as mustard, spices, and particularly pepper, excessive use of meat, and the use of tea, coffee, tobacco, and alcoholic liquors, are very frequent causes of certain forms of skin disease. Skin affections are also, in many cases, dependent upon other diseases, as diseases of the kidneys, inactivity of the liver, constipation of the bowels, scrofula, and syphilis. The skin eruptions which occur in eruptive fevers and which are the result of the disturbance of the system by a specific poison, need not be here considered, as the eruption itself is but a minor symptom of the disease. The popular notion of attributing every disease to a "humor," as remarked above, is without scientific foundation.

General Principles of Treatment.—The same kind of treatment is not effective for all kinds of skin diseases. The fashionable custom of resorting to mineral springs for the cure of skin diseases, no matter what may be their nature, is most unphilosophical, and results in great injury, since, while a few cases may be benefited, a much larger number are rendered worse. The same is true of any other single method of treatment. No matter how successful a remedy may be in one case, in another it may be as signally unsuccessful. Diseases of a purely local character require a purely local treatment. Those in which the general system is chiefly at fault, may require only general treatment, or both general and local; for example, parasitic diseases are cured by local remedies alone. The same is true of such diseases as warts, corns, dandruff, ulcers, or cancer of the skin. Scrofulous eruptions, and affections of the skin due to morbid conditions of the blood or of the internal organs, require only general treatment. Local in-

flammations, hemorrhages, nervous affections, and diseases of the glands of the skin, require both general and local treatment, in some cases one and in other cases the other being most important.

Local remedies chiefly consist of cleansing, stimulating, or astringent lotions, unguents, or of applications capable of destroying vegetable or animal parasites. General measures consist of remedies calculated to improve the condition of the blood and the nervous system. Proper diet is of the first importance, especially in chronic cases. With reference to this class of diseases, Dr. Bulkley of New York, one of the best American authors on diseases of the skin, remarks that in order to accomplish a cure, "we cannot simply apply a wash or a salve, or take a few drops of this or that remedy." Thorough attention must be given to strict compliance with all hygienic rules. Pickles, salads, deserts, etc., rich sauces, pepper, mustard, and all stimulating condiments, fats, fried food, excessive quantities of meat, excessive use of sugar, and all articles of a stimulating and clogging nature, must be wholly avoided. Tea, coffee, tobacco, beer, ale, wine, cider, and all alcoholic beverages, narcotics and stimulants of all sorts must be scrupulously avoided. The diet must be very plain and simple. Excessive quantity is equally as bad as errors in quality. Thorough mastication of food is very important. A fruit and grain diet is much to be preferred to a mixed diet. Milk and eggs can be taken in moderation with a little flesh. The less meat the patient uses, the better. Errors of diet on the part of the mother, is one of the most frequent causes of skin diseases in infants. The children of mothers who are in the habit of drinking ale, porter, beer, and wine, or taking large quantities of tea or coffee, are very likely to suffer with skin diseases.

Some diseases, particularly nettle-rash, or urticaria, are caused by particular articles of food, such as oysters, clams, lobsters, mushrooms, bananas, strawberries, pine-apples, etc. In these cases, it is, of course, necessary to discover the obnoxious article and discontinue it. General baths, such as vapor baths, Turkish, or hot-air baths, and the warm full bath, are of immense advantage in the treatment of many forms of skin disease. The various ointments, lotions, cosmetics, etc., which are sold in drug stores are generally worthless and frequently worse than useless. We have met cases in which exceedingly harmful results had followed the use of these preparations.

Various Forms of Eruptions, etc.—The following are the principal forms of the several elementary lesions of the skin.—

Maculæ, or *Stains*, are simply spots of a round or irregular form, not elevated above the surface of the skin. They may be due to deposits of blood or the coloring matter of the blood, to fungus growth, or to deposits of bile pigment.

Redness, or Hyperemia.—Due to distention of the arteries or veins. When arterial in character, the difficulty disappears upon pressure with the finger. It may be accompanied by violent itching and rising of temperature; is frequently followed by peeling off of the scarfskin. It may be occasioned by local irritation, by changes in the blood, or by nervous excitement.

Wheels consist of reddish swellings with pale centers, which form rapidly and disappear as suddenly. The nettle sting is a perfect illustration of the wheel. They are accompanied by heat and severe tingling. Wheels are characteristic of nettle-rash.

Papula, or *pimples*, are small hard or raised formations in the skin.

Vesicles are little sacs in the skin, containing serous fluid or sweat.

Blebs, or *bullæ*, are simply large vesicles.

Pustules are small, round vesicles containing pus.

Squamæ, or *scales*, are detached portions of the thin scarfskin or epithelial scales.

Tubercles are little solid elevations of the skin, larger than papules.

Nodules are solid masses, larger than tubercles and smaller than cherries. Masses larger than cherries are called tumors.

Scabs, or *crusts*, are dry, hard masses of pus and dead skin.

Excoriation is a removal of the epidermis, exposing, but not injuring, the outer skin.

Ulceration is an excavation made in the skin by disease. It usually leaves a scar upon healing.

Fissure is a crack in the skin, such as occurs on the knuckles when the hands are chapped.

Cicatrix, or *scar*, is a growth of hard fibrous tissue, occupying the place of the healthy tissue, which has been removed by injury or disease. Some diseases of the skin exhibit only one form of eruption, while in others, a number of elementary lesions occur, either at the same time, or in successive stages of the disease. In some cases, also, two or more different diseases of the skin occur at the same time.

ERYTHEMA.

This is a disease of the skin characterized by redness, due to active congestion or inflammation. It may occur as a simple diffused redness, produced by cold, friction from wearing flannel clothes, the rubbing together of two folds of skin, etc. It also accompanies various other diseases of the skin. Sometimes, in addition to the diffused redness, an eruption of small red pimples occurs on the face or hands. The digestion is often disturbed, and the patient feels slightly feverish. The duration of the disease is usually very short, little treatment being required. A form of the affection with which young children sometimes suffer, known as "chafing," or intertrigo, is sometimes quite obstinate.

Treatment.—The diet should be very light and unstimulating. A warm bath should be taken daily, and the affected parts should be covered with a thin cloth moistened with tepid water, or with a solution of saleratus, a teaspoonful to a pint of water. Intertrigo in young children generally arises from indigestion and want of cleanliness. The parts should be thoroughly cleansed with tepid water and castile soap twice a day. They should be afterward bathed with cold water and anointed with vaseline or olive oil. Browned flour, corn-meal, starch, powdered lycopodium seed, and various other powders, are frequently used, though it is doubtful whether they are really required. Very often, fuller's earth may also be useful. When powders are employed, they should be dusted upon the parts after they have been cleansed and dried.

URTICARIA—NETTLE-RASH—HIVES.

This is an eruption characterized by wheels like those caused by nettle stings, each consisting of a white raised spot in the center of a red patch. This eruption is peculiar for the suddenness with which it appears and disappears. The first symptom is severe itching of the skin, after which the eruption suddenly appears. It is generally the result of errors in diet, particularly the use of unwholesome or any irritating food. Canned meats are very likely to occasion it. In some persons, it is occasioned by eating certain fruits, as strawberries, raspberries, pineapples, etc. It may result from simple indigestion. Bites of bugs, flies, lice, etc., should also be mentioned as a cause. The eruption may disappear within two or three hours, or may last two or three days, or longer.

Chronic nettle-rash is generally due to dyspepsia or disorder of the liver. It is often a very troublesome affection.

Treatment.— If the patient suffers with indigestion, lavage or an emetic may be indicated. The itching and burning may be relieved by applying to the skin a lotion made by dissolving a teaspoonful of saleratus or soda in a goblet of water. Vinegar or equal parts of alcohol and water, may also be used. Sponging the surface of the body with very hot water will generally give relief. Urticaria from bites of insects, or nettle stings, in which the pain is often very severe, may be relieved by the application of a mixture of chloroform and glycerine, in the proportion of one of the former to four of the latter.

HEAT-RASH.

This is a form of eruption which often occurs during the intense heat of summer. It may consist of simply a diffused redness of the parts exposed to the direct action of the sun's rays, usually termed sunburn, or in the form of an eruption of minute red pimples, known as "prickly heat" eruption, or "heat eruption," which is accompanied by severe prickling and itching. Sunburn, when severe, is followed by peeling off of the epidermis. Prickly heat generally disappears within a few hours, but may continue some time and become a real eczema.

Treatment.—For sunburn, cool the affected parts with tepid compresses, and anoint well with vaseline. Persons subject to prickly heat should wear silk or cotton next the surface, and should avoid overheating themselves by over-exertion during hot weather. Irritation of the eruption may be relieved by cool baths or cool sponging, bathing the surface with soda or saleratus water, a teaspoonful to the pint. After bathing, the surface should be dried by a gentle patting with a fluffy towel and without rubbing.

ERYSIPELAS—ST. ANTHONY'S FIRE.

This an inflammation of the skin. It generally affects the head and face. It is attended by quite a high fever, which usually begins with a chill. The patient is usually weak and prostrated. The skin is swollen, red, and glossy. There is a burning sensation in the affected parts, and it is tender to the touch. The disease extends quite rapidly, in some cases involving the whole scalp and head. Sometimes the disease extends into the tissues beneath the skin. Blisters and abscesses

sometimes form, in severe cases. Sometimes the fever rises so high as to occasion delirium. When the scalp is severely affected, the hair generally falls out, but soon grows again after recovery. The disease is somewhat contagious ; one attack seems to render a person more liable to another.

Erysipelas is very likely to occur in wounds and after surgical operations, especially in hospitals. In these cases the results are often very serious. The disease is more common in warm weather than in cold. It generally lasts about a week, terminating in the peeling off of the epidermis. The form of the disease known as "wandering erysipelas" generally attacks the extremities first, rapidly extending toward the trunk. In this form of the affection, the fever is generally moderate, but it is likely to continue for several months.

Treatment.—This is quite a serious affection; and unless the attack is a very slight one indeed, a physician should be consulted at once. When the skin is very tense, hot, and painful, cold and even ice compresses should be applied. There is no danger, as many people suppose, of causing the disease to "strike in." Cases in which the disease extends to the membranes of the brain are not due to the eruption being repelled from the surface. The disappearance of the eruption is the result of the occurrence of internal inflammation. The old plan of treatment by encircling the diseased part with a dark line by burning with lunar caustic, is of about equal efficacy with the so-called "sympathetic remedies" often employed for this affection. Nothing equals the application of cold for reducing the local inflammation. It should be carefully watched, however, and as soon as the color of the affected part becomes bluish, purple, or a bright scarlet, the cold should be exchanged for hot fomentations in order to excite activity of the blood-vessels and overcome the sluggishness of the circulation of the affected part. The cranberry poultice and various other similar remedies possess no special value in this disease. The general fever by which it is always accompanied, and which sometimes runs very high, should be treated by means of cool compresses, cool sponging, wet-sheet packs, and cool enemas. The diet of the patient should be very light, and unstimulating in character.

CHILBLAINS.

This is an inflammation of the skin, produced by exposure to severe

cold. It affects parts which have been partially frozen. The feet are most likely to be affected. The skin is red and somewhat swollen, especially in the vicinity of the joints. There is also much burning and itching. In some cases the skin becomes cracked or ulcerated.

Treatment.—For the cure of severe cases of chilblain, a hot and cold foot bath should be taken every night just before retiring. Carbolic-acid ointment, containing ten drops of carbolic acid to the ounce of vaseline or lard, is a very excellent remedy. Cabbage leaves are also a remedy which enjoys some reputation. Another remedy highly recommended is gently rubbing the affected parts with lemon juice just before going to bed. When ulceration occurs, carbolic-acid ointment should be applied with pledgets of cotton.

COLD OR FEVER SORES—HERPES.

In this disease, the eruption consists of patches of little blisters or vesicles, each of which is surrounded by a little ring of inflamed tissue. The eruption is usually accompanied by some fever and pain or smarting in the affected part. They do not generally burst, but dry up, the contents first becoming milky and then a crust forming, which falls off in a few days, leaving a reddish stain in the skin. A very common form of the disease is known as *shingles*, in which the eruption occurs on one side of the trunk, following the course of the nerve. The technical name of this form of the disease is *Herpes Zoster*. It is supposed to be due to an inflammation of a nerve of sensation. There is a popular notion that if this disease encircles the body, the patient will die. The idea is incorrect, however. The disease never does encircle the body, from the fact that the nerve extends only to the central line, though cases have occurred in which corresponding nerves on opposite sides of the body were affected, making a seeming exception to the general rule. The result is no more serious in these cases, however, than in others. A still more common form of herpes is met in the little sores which form about the mouth in fevers, known as cold-sores or fever-blisters. A similar eruption sometimes occurs about the genital organs.

Treatment.—The parts should be protected from irritation by the friction of clothing, and rubbing should be particularly avoided, as the disease will be greatly aggravated thereby, in some cases, scars being formed. An attack of shingles, if not properly treated, sometimes leaves a neuralgia behind it. The affected parts should be dusted with

powdered starch, or smeared with carbolic-acid ointment,—ten drops of carbolic acid to the ounce of vaseline,—covered with cotton or wool. The neuralgia, which sometimes continues afterward, should be treated by fomentations. The formation of cold-sores can generally be checked by the application of spirits of camphor to each blister.

ECZEMA—SALT-RHEUM—MOIST TETTER—SCALL.

This is one of the most common of all skin diseases. It occurs in a great variety of forms and at all ages, and is said to constitute one-half of all the cases of skin disease. It is not contagious, as many persons suppose. Its most common location is on the face and scalp, and about the thighs. When the eruption first begins, it appears as a number of red points, papules, or vesicles, which run together, and, after being scratched, exude moisture. It is accompanied by great itching. After a time, scabs are formed. In infancy, the scalp is most often affected, when the disease is termed *scald-head*, or *milk-crust*. The eruption is also sometimes called *tooth-rash*, in children, when it occurs during the teething period. When the eruption has a free liquid discharge, it is sometimes called moist or running tetter. A mild form of eczema sometimes attacks infants in hot weather, when it is termed *heat eruption*, *red-gown*, or *red-gum*. What is known as chafing, or intertrigo, is also a form of eczema. Eczema is frequently seen in children in the form of raw, red patches, with a moist surface, situated within the bend of the elbow or knees, or behind the ears. Washerwoman's, brick-layer's, grocer's,and baker's itch are different forms of eczema in which the hands are affected, the cause being the various irritants to which the hands of these different classes of persons are exposed. Eczema of the legs is often observed in old people and persons of sedentary habits. An exceedingly aggravating form of the disease is frequently due to varicose veins, and sometimes gives rise to ulcers. In acute cases, the eruption generally presents a red surface, exuding moisture. In chronic cases, the skin is thickened and covered with dry, hard scales. It is almost always accompanied in all its stages and forms by fearful itching. It is sometimes difficult to detect, owing to the fact that it may resemble almost any other disease of the skin.

Eczema may be produced by anything which irritates the skin, poison dye-stuffs, colored underclothing, stockings, hat linings, arnica, poison ivy, friction of the skin, uncleanliness, especially in children whose diapers are not properly changed. Irritating soap, ex-

posure to heat and cold, and various other changes, are frequent causes of eczema. Dyspepsia, rheumatism, gout, scrofula, and any disease which greatly deteriorates the general health, may produce eczema.

Treatment.—The disease is often very chronic and frequently obstinate. It is, of course, necessary that all the known causes of the disease be first removed. When there are external irritants brought in connection with the skin by the daily occupation, either the patient must rest from labor or engage in some other business. It is very important to give attention to the general health, especially the improvement of the digestion, and the removal of gouty, rheumatic, or scrofulous conditions of the system. These conditions have been fully described elsewhere. In many cases a course of thorough eliminative treatment is required to get the blood in a good condition. The irritation or itching may often be relieved by bathing the parts in saleratus water, a drachm to the pint, by carbolic-acid ointment, ten drops to the ounce of vaseline, by bran tea, starch powder, and other soothing applications. A very excellent lotion for use in these cases is the following: Two drams of carbonate of soda, one ounce of glycerine, seven ounces of bran tea or slippery-elm water. In eczema of the head, it is often necessary to cut the hair close to the scalp. When thick scabs are formed, they may be removed after softening with vaseline or sweet oil, which should be freely applied at night and covered with a cloth held in place by a night-cap or bandage. A hot spray applied from five to fifteen minutes two or three times a day is an excellent remedy when there is thickening of the skin, especially in old cases. Tar, or zinc and tar, ointment, is also useful.

PSORIASIS—DRY TETTER.

This disease may affect persons of all ages, but is most common in adults. The eruption consists in separate spots or patches of a dull red color covered with an abundance of white, branny scales which fall off readily. The separate patches are generally circular. The eruption occurs most often on the outer surfaces of the joints, as of the elbow, the front of the leg, or knee, being by this particular distinguished from eczema, which most often affects the inner surfaces, as the bends of the elbows and knees. It often attacks the scalp, when it is the cause of dandruff. Psoriasis also differs from eczema in that it seldom presents a moist surface and rarely itches. The disease is sometimes very chronic, lasting many months or even years. The

causes of the affection are somewhat obscure. It is probably generally due to disorders of nutrition. It is not in the slightest degree contagious. Sometimes eczema and psoriasis are combined.

Treatment.—This disease is sometimes very difficult to cure, and it has a stubborn tendency to return. Very frequently, just as one set of spots has disappeared, another crop will make its appearance. Especial attention should be given to the general health. The diet should be simple, but unstimulating; it should be mostly fruits and grains. The patient should take frequent baths. We have seen some cases very greatly benefited by the vapor bath. Packs are also useful, but the skin should not be excited too greatly, especially when the eruption has a very reddish appearance. Carbolic-acid ointment and tar soap are of some value as local applications. Bathing the affected parts with saleratus or soda water is also useful.

ACNE—FACE PIMPLES.

This is a very common affection, especially between the ages of fifteen and thirty years. The seat of the disease is the sebaceous follicles or oil-glands of the skin. The eruption consists in pimples scattered over the face, neck, back, and chest. The inflammation of each follicle may run its course in three or four days, or may continue for a week or ten days. When the inflamed part becomes indurated, or hardened, the inflammation may continue for several weeks. Several varieties of the disease are observed; that just described is the most common. Another form consists in obstruction of the outlets of the sebaceous glands, producing what are sometimes termed flesh-worms, or grubs. This form of acne is indicated by little black specks, seen upon different parts of the face, but chiefly upon the skin of the nose. Each speck marks the obstructed outlet; and if pressure is made on either side, something having the appearance of a small grub may be pressed out. Upon careful examination, this so-called grub proves to be a mass of hardened sebaceous matter, or sebum, which has assumed its grub-like form by being pressed through the small mouth of the follicle. The black speck, giving to this little cylinder of fat the appearance of a head, is simply a small accumulation of dirt. The technical term for one of these little masses is *comedo*. When examined under a microscope, these are often found to contain a whole family of parasites, male, female, and their numerous progeny

In Plate VIII may be seen an excellent representation of these parasites, which rejoice in the title of *demodex folliculorum*. It is not probable that this parasite gives rise to the disease, but rather that the distended follicle furnishes an agreeable home for this insect, which is closely related to the *acarus scabiei*, or itch mite. In another form of acne, in which the nose and the adjoining portions of the cheek are chiefly involved, in addition to the pimples described there is intense congestion and redness of the parts, due to enlargement of the blood-vessels which are sometimes so much distended as to be distinctly visible. This form of the disease is termed *acne rosacea*. In still another form of the affection the inflammation is chiefly confined to the roots of the hairs. This form is sometimes known as *barber's itch*. The chief causes of acne are erroneous dietetic habits. People suffering with acne can bring on an attack at any time by the use of rich pastry, fried food, and large amounts of sugar or sweet food, etc. Doughnuts, griddle cakes, cheese, hot bread, preserves, candies, and similar dietetic abominations, are very active causes of different forms of this affection. *Acne rosacea* is very frequently the result of using alcoholic liquors in some form, on which account it is sometimes termed, when seen in persons addicted to drinking, the "rum-blossom." Acne is sometimes the result of debilitating habits, particularly secret vice in young persons, though it should be by no means supposed that every young person affected with this disease is addicted to secret vice.

Treatment.—This disease is often very obstinate. It may only be cured by entire discontinuance of all the causes. The person subject to it must live upon the most simple and unstimulating diet. Articles of food mentioned as causes must be scrupulously avoided. The diet of the patient should consist of cooked grains and fruits. Fat meats, and fat in all forms, used as seasoning in food, must be strictly excluded from the dietary. The less sugar taken the better. Hot coffee must also be avoided, together with alcoholic liquors and tobacco. Daily baths, the wet-sheet pack two or three times a week, fomentations over the region of the liver, and the abdominal bandage worn nights, are the principal measures of treatment to be recommended. Disorders of digestion, of the liver, of the menstrual function, and other internal maladies should receive such attention as the particular case may demand. It is especially important that constipation of the bowels should be relieved by proper diet, and, if necessary, by the enema or other measures recommended for this condition.

When there is much irritation of the face, warm poultices, hot vapor douches, and sponging with water as hot as can be borne, are the proper remedies. A soft sponge should be used.

The face should be kept covered with vaseline so as to protect it from the air. Cocoa butter will answer the same purpose. In the variety of the disease chiefly characterized by comedones, the internal use of glycerine in doses of two or three tablespoonfuls, taken half an hour after each meal, has been highly recommended. It is probably beneficial by preventing fermentation of the food. The face should be washed two or three times a day with a solution of soda, saleratus, or borax, a drachm to a pint of water. These lotions are improved by adding an ounce of glycerine to each pint of water. An ointment composed of thirty drops of carbolic acid, two drachms of glycerine, half an ounce of vaseline, thoroughly mixed, is very useful in chronic cases in which there is considerable induration. If irritation of the skin is produced, a little more vaseline may be added. The ointment should be applied at least twice a day, after the face has been washed with soda or saleratus solution. The following preparation is also useful as an ointment to be applied at night, being thoroughly rubbed in: Sulphur and glycerine, a teaspoonful each; vaseline, one ounce. The ointment may be scented with rosemary or any other agreeable oil. The last-named remedy is also excellent for use in acne rosacea.

COMEDO, OR "BLACK-HEADS."

When these are present in large numbers, the face appears as though gun powder had been blown into it, or pepper sprinkled over it. It is best to remove them, as, if not removed, nature undertakes the work by setting up an inflammation about each one and producing real acne. They may be squeezed out by pressure between the nails, but are best removed by a little tube with an opening about the thirty-second of an inch in diameter, or a watch key, which should be pressed directly down upon the affected gland, care being taken not to injure the skin by too great pressure. The further treatment of comedo should be the same as recommended elsewhere for oily skin.

PEMPHIGUS—WATER BLEBS.

This eruption consists of water blisters, varying in size from that of a pea to that of an egg, or larger.

Treatment.—This is a very severe disease, and is often fatal. The blebs should not be ruptured, but the fluid may be let out of them by pricking with a needle. Hebra, the great dermatologist of Vienna, many years ago insisted that bathing was injurious in these cases; but on calling at Hebra's Hospital in Vienna, in 1883, we found patients receiving treatment by prolonged immersion in water about the temperature of the body. He keeps some cases immersed six or eight months.

IMPETIGO.

This is an eruption characterized by small pustules. It is really a variety of eczema. It frequently occurs about the mouth and nose in children. There is a contagious variety of this affection in which the pustules are small and flat, and spread rapidly over the body, generally beginning on the upper part of the body and extending downward.

Treatment.—The treatment is essentially the same as that recommended for eczema.

ECTHYMA.

This is a mild form of inflammation of the skin. It is characterized by small pustules surrounded by a ring of hard tissue. The eruption is frequently produced by scratching induced by lice. The eruption may be occasioned by local irritants of any kind in persons who are badly nourished.

Treatment.—Remove the cause, if due to the presence of lice. When the pustules become ulcerous, carbolic-acid ointment should be applied. If due to debility, attention should be given to the general health. If the ulcerations become quite severe and foul, the following is an excellent preparation: Boil a teaspoonful of starch in two teaspoonfuls of glycerine and six of water; when nearly cold, add a teaspoonful of tincture of iodine. Apply a little to each ulcer every day or two until a more healthy appearance is produced.

PITYRIASIS.

This disease consists in an excessive shedding of the scarf-skin in the form of branny scales. It may result from local irritation or general mal-nutrition. It very frequently affects the scalp, being one cause of dandruff. A peculiar form of the disease, known as *pityriasis rubra*,

or red pityriasis, begins on some part of the body as a red scaly spot, which rapidly extends over the whole surface. The body is intensely red, and covered by scales which fall off in large quantities. The face is also red, as well as other parts of the body, and the head is affected by profuse dandruff.

Treatment.—The lighter forms of the affection are relieved by simple inunction of the skin. The skin should be kept constantly covered with some simple unguent, as vaseline, olive oil, or cocoanut oil. In the severe form of the affection, the same treatment should be employed, with the addition of daily sponging with water as hot as can be borne.

PRURIGO.

This is a disease of the skin characterized by small, hard, pale, or flesh-colored pimples, which, in their earlier stages can be felt under the skin often before they are visible. The eruption is attended by violent itching, and a sensation as of ants crawling upon the skin.

Treatment.—Vapor baths, packs, full baths, hot sponging of the skin, and improvement of the general health.

ELEPHANTIASIS.

There are two varieties of this disease, one known as *elephantiasis arabum*, the other, *elephantiasis Græcorum*. The latter disease is that more commonly known as leprosy. The first mentioned disease consists in a chronic enlargement of some portion of the body. The part most likely to be affected is the leg, which becomes thickened and clumsy, sometimes to such a degree as to render the patient weary of life. The principal seat of the disease seems to be the skin. There is considerable pain in the affected part, the skin of which may be either smooth or ulcerated. Next in frequency to the legs, the genital organs are affected, sometimes attaining an enormous size. The nose is a frequent seat of the disease in spirit drinkers, sometimes attaining mammoth proportions. This disease is sometimes called elephant-leg, or Barbadoes leg.

In true leprosy, three classes of symptoms appear: 1. Discoloration of the skin, which acquires, in spots, a light coffee hue; 2. A deposit in the skin of tubercles of a dull red color; 3. Loss of sensation in certain parts, particularly in the extremities, due to disease of the trunks.

The thickening of the skin chiefly occurs about the eyebrows, cheeks, forehead, and nose, giving to the patient a very singular appearance. The hands are frequently distorted, the fingers being contracted, giving to them a claw-like appearance. After some years, the tubercles ulcerate, causing gangrene of some parts of the body, especially the fingers and toes. Loathsome odors emanate from the body.

Treatment.— There is little chance for effecting a cure in either of these maladies. In cases of elephantiasis Arabum confined to a single part of the body, amputation has been sometimes performed with advantage. Two remedies, one known as gurjun oil, and a more recent one, chaulmoogra, are much used in India for leprosy, and are said to have been effective in curing a number of cases. Improved dietetic and hygienic conditions are especially important in the treatment of leprosy, since it has been found to occur more frequently in badly fed persons, and those surrounded by insanitary conditions. The use of salt meats is said to favor the production of the disease, which indicates that all foods of this kind should be avoided as much as possible. In a case which has been under the writer's observation for the last fifteen years, wet-sheet packs have proven of great service in combating the inflammatory attacks which characterize the disease. A friend tried the same remedy on a patient in the Sandwich Islands, with excellent success.

MEDICINAL ERUPTIONS.

Many medicines occasion eruptions upon the skin. Arsenic produces herpes, hardness of the palms of the hands, eczema, and ugly ulcerations, by contact with the skin. Iodide of potash produces acne. Bromide of potash produces acne and ecthyma. Tar is a cause of comedo and acne. Copaiba occasions terrible itching, and frequently urticaria and vesicular eruptions. Arnica and sulphur both give rise to eczema.

OILY SKIN.

In some persons there is an excessive production of sebacous matter or sebum, due to morbid activity of the fatty glands of the skin. The skin of such persons presents a shiny look. Little beads of oily matter may be seen at the mouths of the glands near the roots of the

hairs. The forehead, nose, and cheeks are most frequently affected. When the scalp is affected, the condition may be indicated by soiling of the pillow. Acne is frequently accompanied by this condition.

Treatment.—The only treatment to be employed is the frequent application of soap. When many of the glands are clogged up, as indicated by the abundance of grubs, the surface should first be thoroughly rubbed with warm oil. Cocoanut or almond oil is the best. After half an hour the surface should be rubbed with a flannel cloth, thoroughly saturated with soap moistened with warm water, and stretched over the fingers; or a soft sponge may be used. This is best done at night, just before retiring. When the secretion of fat is very profuse, the operation may be repeated two or three times a day.

DRY SKIN.

A condition of deficient secretion of fats is very frequently met with in cases of dyspepsia and in persons suffering with other wasting diseases. The best remedy is the daily application of the oil bath, which should be given according to the directions on page 673.

This is a condition in which branny scales are shed from the scalp in great abundance. It may be due to eczema or pityriasis, as already remarked, or may result from a disorder of the sebaceous glands, and from acne. The latter is the most common cause of the disease. In this form of the affection, the abnormal secretion of the fat glands, appears upon the scalp as yellowish scales. This condition is akin to that described under the head of oily skin, being, in fact, a dry form of the same disease. This condition is sometimes present upon the nose and cheeks as well as the scalp. It is often a very annoying complaint. When affecting the scalp, it sooner or later results in loss of the hair. This is not because the dandruff destroys the hair, but because the same disease which causes the dandruff interferes with the nutrition of the hair, thus occasioning its loss. On account of its tendency to produce baldness, the disease should never be neglected. Dandruff is generally occasioned by disorder of the digestion, or some other debilitating disease.

Treatment.—Restore the general health by proper attention to the digestion and general hygiene. For dandruff of the face, apply

the same remedies recommended for the skin. The scalp should also be treated in the same way, by gentle shampooing with ordinary washing soap, once or twice a week. A very soft brush should be used. Neither a stiff brush nor a fine comb should ever be used for removing dandruff. For shampooing, a liniment composed of equal parts of castor-oil and alcohol may be rubbed on the scalp, or an ointment composed of a drachm of tannin to an ounce of vaseline.

MILIA AND WENS.

Milia consists of little globular bodies found just beneath the surface of the skin, chiefly upon the face, in the vicinity of the lower eyelid. They consist of sebaceous follicles, the mouths of which have been entirely closed up, causing an accumulation of sebaceous matter: Wens are milia on a large scale. They occur most frequently on the scalp and face.

Treatment.—Open the top of each little globule with a needle, and squeeze out the contents by pressure between the finger nails or with a watch-key. Wens are to be treated upon the same principle.

EXCESSIVE SWEAT—HYPERIDROSIS.

This is a condition in which the sweat-glands are excessively active. The palms of the hands and feet are most often affected, sometimes to such an extent as to give to these parts a parboiled appearance. Persons troubled with excessive sweating of the feet, generally carry with them a disagreeable odor, due to the perspiration with which the stockings, and even boots or shoes, become saturated.

Treatment.—Take each night and morning an alternate hot and cold foot bath, dipping the feet first into the hot and then into the cold water, every half minute for fifteen or twenty minutes. Wipe the feet dry, and apply a strong decoction of white-oak bark, or a solution of tannin in water, two drachms to the ounce, or, better still, a solution of tannin and glycerine in the same proportion. The old boots or shoes saturated with perspiration, should be disused, and a new pair purchased. The stockings should be changed every day. Rubbers and other impervious foot coverings should not be worn, or should be kept on as short a time as possible. Cloth boots are better than leather, on account of giving the air access to the feet.

OFFENSIVE PERSPIRATION.

This is a condition which is sometimes exceedingly annoying. It is occasioned by the excretion in the sweat of elements of an offensive character. Odors of various kinds are produced. Rheumatic persons are generally most disagreeably affected. The arm-pits are the portions of the body most frequently affected, the offensive odor arising from the feet being due to decomposition of the sweat, and not to the abnormal character of the secretion. This condition is sometimes very difficult to overcome. The best remedy is thorough cleansing of the parts, at least twice a day, with soap and water, or some disinfectant lotion, as permanganate of potash, a solution of chlorinated soda, or with two or three per cent of carbolic acid. Washing the affected part with a solution of chloral, a drachm to the ounce, is a recently recommended remedy. What is known as *bromidrosis* is a condition in which the perspiration imparts to the clothing some peculiar color.

ITCHING—PRURITUS.

Itching is due to some form of skin disease when accompanied by an eruption. When not accompanied by eruption it is usually due to some irritating element in the blood, to parasites, to the wearing of flannel under-clothing, or to some disorder of the nerves. Very often an eruption appears where none existed at first, in consequence of scratching. Itching increased at night, and accompanied by a pimple rash in the bend of the arms, front of body, and between the fingers is very suspicious of the itch. Itching about the fork of the thigh is indicative of parasites. Wandering itching at night with no visible eruption in the day time is characteristic of urticaria.

Many persons are greatly troubled with an itching, usually without eruption, on the approach of cold weather. This has been termed *winter pruritus.* In some of these cases little pimples may be seen at the roots of the hairs. This form of itching is due to inactivity of the skin, with a clogged state of the liver in consequence of the excessive use of sweets, fats, and animal food. It is most active in cold weather on account of the lessened activity of the skin at that time. Eczema and other skin affections may be excited by scratching.

Treatment.—Correct diet. Encourage the activity of the liver and bowels by fomentations over those organs. Kneading and percussing the bowels, wet-sheet pack, vapor baths, enemas when necessary, and

obedience to all hygienic laws. When there is great irritation, apply saleratus or soda water, a dram to the pint, carbolic-acid ointment, borax-water, and sometimes starch. Anointing with simple vaseline is often effective. For temporary relief, vinegar, lemon juice, and solution of carbonate of soda, a dram to the pint, are also excellent. Frequently galvanism is very effective in removing intolerable itching, either applied to the affected parts, or to the nerve centers from which the nerve supply is furnished, or to both.

PURPURA—THE PURPLES—LAND SCURVY.

The eruption consists of small round spots or blotches in the skin, bright red at first, soon becoming of a darker hue and then fading after a few days, presenting the various colors seen in a fading bruise. First appears in the legs. A disease known as *purpura hemorrhagica* is a more severe form of the same affection, the amount of blood exuded beneath the skin being very much greater. *Sea scurvy* is an allied disease which is accompanied by other symptoms of a grave character. The principal causes of the disease are confinement too closely to animal food, especially salt meat and innutritious food. It is very common among English women who live on strong tea and white bread.

Treatment.—This consists almost exclusively in improvement of the dietary. Tonic baths, massage, and electricity are also useful aids in treatment. The tissues of the legs should be supported by elastic bandages or stockings.

FRECKLES—LENTIGO.

These consist in an increase of the pigment or coloring matter of the skin in small spots. They most often occur in persons who have delicate skins, being greatly increased by exposure to sun and wind, though not produced by them, as is tan. They do not necessarily indicate an inactive state of the liver. Quite eminent authorities on lung disease declare that freckles indicate a predisposition to consumption.

Treatment.—Very difficult of removal, and impossible if patient continues exposure. It is better to have the freckles than to forego the valuable influence of the sunshine and fresh air. The advertized lotions and cosmetics are either dangerous or useless. The following are a few of the best-known remedies for the removal of freckles and tan:—

1. Three tablespoonfuls of fresh scraped horse-radish; buttermilk, a pint. Allow to soak six or eight hours, shaking occasionally. Cider vinegar is sometimes used in place of the horse-radish. Apply to the face at night, leaving on till morning.

2. Two tablespoonfuls of lemon juice; an equal quantity of water; a tablespoonful of glycerine; a heaping teaspoonful of powdered borax. Apply three or four times a day, drying after fifteen or twenty minutes with a fluffy towel.

MOTH PATCHES—LIVER SPOTS—CHLOASMA.

The brownish spots of irregular shape and size often seen upon the face, and popularly known as "liver spots," are similar to freckles, but larger in size. They often accompany disease of the liver, and are not infrequently present in diseases of the womb, which may be due to the fact now well understood that disease of the liver is a not infrequent cause of disease of the womb.

Treatment.—Little or nothing can be done for these blemishes except to improve the general condition as much as possible.

MOTHER'S MARK—MOLE—NÆVUS.

These are of various kinds: 1. Raised brown spots on the face, or moles; 2. Brown spots producing hair; 3. A tumor composed of enlarged blood-vessels, constituting the true "port wine" or "mother's mark." These marks do not originate in ante-natal influences, as many persons suppose. Their origin, is, however, obscure.

Treatment.—Washes and other external applications are of no value. They can only be removed by a surgical operation. Electricity has proved of great service.

ALBINISM AND PIEBALD SKIN.

An albino is an individual whose body is lacking in coloring matter, the pigment being absent. In some individuals this condition is shown in a partial loss of color, producing a spotted appearance. The disease most often occurs in negroes, giving them a very peculiar appearance.

FISH-SKIN DISEASE—ICHTHYOSIS.

In this disease the surface is hard and dry, and is marked off

in such a way as to give the appearance of scales. Patient seldom perspires. Skin often cracks. In slight cases, small patches of brown warty growths appear. When these are abundant, the patient is termed a "porcupine man."

Treatment.—Probably incurable; but the sufferings incident to the disease can be very greatly mitigated by warm, alkaline baths and unguents. Use about three ounces of soda or borax in a full bath tub of water. Bran baths and wet compresses are also useful. Careful attention should be given to the general health.

SCLERODERMA.

A condition in which portions of the skin are hardened and have a hide-bound appearance. The tissues cannot be taken up between the thumb and finger or wrinkled. Often attacks the nape of the neck. The hardened portion, which has a yellowish appearance, may extend over a large area, or be confined to bands. In some cases, the stiffness interferes with the movements of joints and with respiration.

Treatment.—Improve the general health. Soak the affected part in water one or two hours daily, or apply a warm poultice for the same length of time, and after drying, rub well with vaseline, cocoanut, or olive oil.

KELOID.

A firm, prominent, pinkish nodule which often appears in a scar from a burn or surgical operation, and sends out processes which contract and pucker the tissues. In a severe case which we met in a city hospital, the growth existed upon the face and produced a hideous deformity. The disease should be let alone. Removal does no good, as it returns.

LUPUS—EATING TETTER.

This disease is characterized by the growth in the skin of tissue similar to that of a healing sore. Its most favorite site is the cheek, near the nose. The affection often appears upon both sides of the face and bridges the nose. After a time ulceration occurs. It is a tuberculous affection.

Treatment.—Removal by means of caustics. The galvano-cautery is the best means to use. The general health must be improved by all hygienic means.

ECZEMA OR MOIST TETTER.

CHICKEN-POX.

PSORIASIS, OR DRY TETTER.

HERPES ZOSTER, OR SHINGLES.

CALLUS.

This is a thickened condition of the epidermis or scarfskin. It is most likely to occur over joints and the prominent points of bones. It is generally produced by prolonged pressure. Its object is the protection of the sensitive parts beneath from injury. A callus does not usually require treatment except when the part becomes inflamed. The proper treatment is soaking in very hot water for fifteen or twenty minutes three or four times a day, and the wearing of a poultice or wet compress the balance of the time.

Corns are modifications of the callus, the treatment of which is deferred to the section on surgery.

ITCH—SCABIES.

This disease is by no means so frequent in this country as in some others. It is said to constitute about one-fourth of all the cases of skin disease in Glasgow. The disease, as is now well known, is caused by the presence of an animal parasite, the *acarus scabiei*, shown in PLATE VIII. This little insect, which is barely visible to the unaided eye, burrows in the skin, making a somewhat crooked channel in which it deposits its eggs (Fig. 339), which in due time are hatched, and rapidly develop into full grown *acari*. The female is the cause of all the mischief, as she alone burrows, the purpose being to deposit the eggs just under the surface of the epidermis. The track left by the insect in burrowing can be readily seen by the aid of a small magnifying glass as a little dotted line about one-fourth of an inch in length. The eruption varies much in different cases, sometimes being very scanty, in other cases resembling a bad case of eczema. It is most often found

Fig. 339.—Female Itch Mite Laying Eggs in a Burrow.

between the fingers, in the bend of the elbows and knees, and upon the front of the body. The itching in some cases is most intolerable, in others slight. It is most severe at night. It is in some cases very difficult to decide whether or not a patient has *scabies* or some other skin disease.

A variety of the disease known as grocer's itch is sometimes produced by the irritation of an insect known as the *acarus sacchari.* PLATE X.

Treatment.—The only efficient remedies are such as will kill the parasites. No internal medication is required. The insects may be destroyed in a variety of ways; by smothering, by drowning, or by poisoning. The itch insect requires air as well as larger animals. If the skin is thickly smeared with mutton tallow or some other unguent of considerable consistency, the unguent being applied at least twice a day for some time, a cure may be effected. Prolonged immersion in water, and daily wet-sheet packs, followed by thorough shampooing, are effective measures if perseveringly employed; but the most expeditious manner of getting rid of the vermin is to apply to the skin some unguent containing substances poisonous to them. The patient should take a thorough soap bath at night, soaking the body for at least an hour in the warm water. If possible, a vapor bath should be taken before the full bath, so as to thoroughly loosen the old epidermis. In the full bath the skin should be thoroughly shampooed with a flesh brush and soft soap. After the bath, the patient should apply to the affected parts of the body and contiguous parts any one of the different ointments given on pages 800 and 801. If sulphur ointment is used, it should be left on over night and worn during the next day if the odor is not very objectionable. The next night the same process should be repeated. Care should be taken to change all the clothing at the beginning of treatment and again at the close. One or two applications are usually sufficient. A third one is only occasionally required. The irritation of the skin may be somewhat aggravated by the treatment. It will subside in a few days under the use of simple vaseline ointment. Some persons make the mistake of keeping up their vigorous treatment so long as there is an eruption. It should be understood that the eruption and the real cause of the disease are two distinct things.

The clothes of a patient who has had treatment for itch should

be thoroughly baked for at least two hours. Clothing will readily withstand a temperature of 350° without scorching.

LICE.

Pediculosis, or lousiness, may result from the infesting of the body by any one of three varieties of the louse insect, or pediculus. They

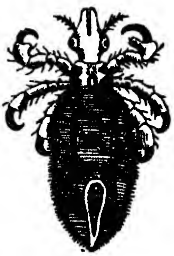


Fig. 340. The Head Louse.

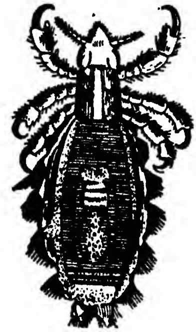


Fig. 341. The Body or Clothes Louse.

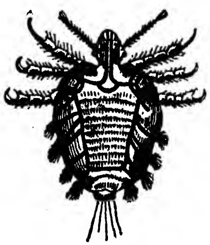


Fig. 342. The Crab or Pubic Louse.

are known respectively, as the *head louse*, the *body* or *clothes louse*, and the *crab louse* or "*crabs*." See Figs. 340, 341, and 342 for representations of these three kinds of lice. Lice multiply very rapidly. A single female will produce in the course of a couple of months 5,000 new individuals. Very frequently an eruption may be seen, which is produced by the irritation of the insect and the scratching of the patient. Head lice deposit their eggs, or "nits," upon the hair, as shown in Fig. 343. Sometime these are the only traces of the insect to be found. These "nits" cling very closely to the hairs to which they are attached until they are destroyed or hatched.

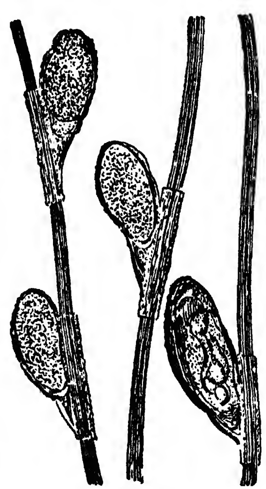


Fig. 343. Nits, or Eggs, of the Head Louse.

Lice do not usually exist except on persons who are filthy in their personal habits, although the most cleanly individual might become infested by contact with a person who harbored them in large numbers. Very frequently these parasites exist for a long time unsuspected. They can only be detected

by careful scrutiny of the affected parts for the insects or their "nits." Body lice generally deposit their nits in the seams of the garments, and themselves usually cling to the clothing when it is removed.

Treatment.—For head lice, saturate the hair with kerosene oil two or three times a day for two or three days; then wash the head with soap and water. This is not a very agreeable remedy, but is a safe and certain cure. Another remedy is a lotion made by steeping half an ounce of bruised stavesacre seeds in a pint of equal parts of vinegar and alcohol. Wash the head with the solution twice or three times a day for a day or two. The following is another good remedy: Carbolic acid, one drachm; glycerine, one-half ounce; alcohol, one ounce. Mix the carbolic acid thoroughly with the alcohol and glycerine, then add four ounces of water. Shake well before using. Must be employed with some caution, but is a good remedy. Bathe the head with it carefully twice or three times a day for two days.

Body lice can usually be cured by changing the clothing, and warm bathing with soap and water. It is better, however, to apply to the skin of the affected parts some parasiticide ointment. The following is excellent: Soak half an ounce of powdered stavesacre in an ounce of hot olive oil for half an hour; add an ounce of vaseline. This ointment is also excellent for head lousiness. It should be well rubbed in.

The crab louse usually affects the hair of the covered portions of the body only. The best remedies are cleanliness, thorough washing with soap, and the application of mercurial ointment. Care should be taken in the use of this ointment, as harm may be done by its absorption into the system. In order to render a small quantity efficient, it is a good plan to clip close to the skin the hair of the affected parts. The ointment should then be applied at night and washed off in the morning, the clothes being changed for new ones, or those which have been freed from the parasites. Kerosene oil, or crude petroleum, may also be used as directed for head lousiness, and is a safer remedy.

In all varieties of lousiness the bed clothing, as well as personal clothing, should be thoroughly boiled or baked in an oven, as this is the only means of destroying the insects and their eggs. In cases of body lousiness, the seams of the clothing should be ironed with a flat-iron as hot as can be used without scorching. If this plan is not successful, the seams may be saturated with a solution of carbolic acid, twenty drops to the ounce of water.

RINGWORM.

This is a parasitic disease, in which a fungus grows upon the skin. The scalp, the beard, the nails, or the general surface of the body may be affected. In Fig. 344 may be seen the appearance of the fungus under the microscope. Fig. 345 shows an affected hair greatly magnified. The fungus is called, scientifically, *trichophyton tonsurans.* It is a contagious affection.

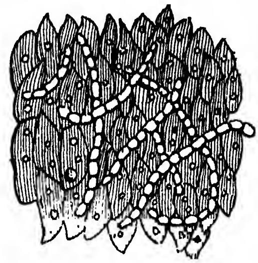


Fig. 344.—Ringworm Parasite, greatly magnified.

When it occurs on the body, the disease usually spreads in a circle, from which the affection takes its name.

When the scalp is affected, the hair falls in circular spots, upon examination of which numerous short stumps of hairs may be seen, in which respect this disease differs from baldness due to other causes. The affected portions of the scalp present the appearance of the skin of a plucked fowl, and numerous white scales. The disease extends into the hair follicles and the hairs. The affection is quite obstinate, and when it exists for a long time, may occasion permanent baldness. It occurs most often in charitable institutions, where a large number of children are brought together.

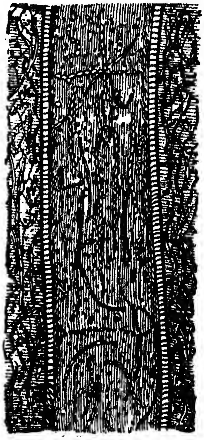


Fig. 345.—A Hair affected by Ringworm.

Ringworm of the beard, or *sycosis,* commonly known as "barber's itch," is a not uncommon malady, but often very obstinate to cure. It rarely occurs except in persons accustomed to be shaved at a barber shop, where the disease is almost always contracted. Not infrequently a very considerable degree of inflammation of the skin of the face is produced, giving rise to nodules, pustules, and various other forms of eruption.

The fingernails are sometimes affected by this disease, as well as other parts, becoming dry, thickened, brittle, and opaque.

Treatment.—When the disease occurs upon the general surface of the body, or upon a part not covered with long hair, it may be readily cured by the application of a solution of carbolic acid made

as follows: Carbolic acid, one drachm; glycerine, one-half ounce; water, two ounces. Apply to the affected parts with a brush, daily, until the disease disappears. A strong solution of sulphurous acid may be successfully employed, or a hot solution of bichloride of mercury, one part to two hundred. Any scabs present should be softened and removed by an application of olive or cod-liver oil over night, then cleanse the other parts with soft water.

When the scalp and beard are affected, the hair must be pulled out by means of pincers before the remedy is applied. This is necessitated by the fact that the disease penetrates to the bottom of the hair follicles. The hair thus pulled out always grows again, as the roots are left. Several months' treatment is often necessary to effect a cure in these cases, the same hairs having to be pulled again and again before they remain healthy. The remedy must be applied, and well rubbed in each time, after a portion of the affected hairs have been pulled, and once or twice a day in addition.

FAVUS.

This is another vegetable parasitic disease of the skin. See Fig. 346. Any portion of the skin may suffer, but the scalp is most likely to be affected. The disease is characterized by the formation of yellow crusts, which are depressed at the center, at which a hair may generally be seen. The affection begins in the hair follicles, and extends to the whole skin of the affected part. The crusts are formed almost wholly by the growth of the fungus. They have an odor similar to that of mice, which are also very subject to this disease.

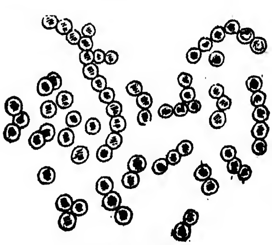


Fig. 346.

Treatment.—This malady is very obstinate, being more difficult to cure than ringworm of the scalp. After thoroughly cleansing the parts, as in the treatment of ringworm, apply a hot solution of bichloride of mercury, one part to two hundred of water, a ten-per-cent solution of chrysarobin, ichthyol, or a solution of carbolic acid in oil, one-half dram to four ounces. The remedy first named is most efficacious.

TINEA VERSICOLOR.

The old name for this affection is *pityriasis versicolor*. It consists

in an eruption of slightly elevated, irregularly shaped, yellowish or brownish spots, most often found upon the chest. This is also a parasitic disease. The microscopic appearance of the fungus peculiar to it is shown in Fig. 347. It is often mistaken for "liver spots." It is contagious; may last any length of time.

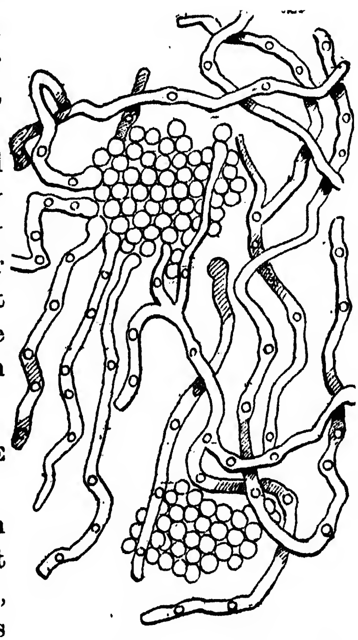


Fig. 347. Parasitic Fungus of Tinea Versicolor.

Treatment.—Wash the parts and the whole body thoroughly every day with soap and water, and then apply any of the remedies recommended for ringworm. It is not difficult of cure; but treatment should be continued for some time after the eruption disappears, in order to insure a permanent cure.

HIRSUTES—OVERGROWTH OF THE HAIR.

This morbid condition consists in an abnormal development of the fine, short hairs. It is most troublesome in ladies, in whom the hair of the upper lip is sometimes sufficiently developed to form a mustache. We recently met a case in which a full silken beard had grown. In Fig. 348 and 349 may be seen two most remarkable examples of hirsutes.

Treatment.—The so-called *depilatories* sold for the relief of this condition are worthless. They do nothing more than to remove the external portion of the hair, only penetrating a short distance into the hair follicle, and hence the hairs soon grow again. Being usually composed chiefly of lime, considerable irritation is not infrequently produced, and sometimes quite severe disease of this portion of the skin. Pulling out the hairs is only temporary in its effects, although more lasting than any depilatory. The only cure is destruction of the root of the hair or its folli-

Fig. 348.

cle. This may be accomplished by passing into the follicle a fine glover's needle and twisting it about in such a way as to excite sufficient inflammation to obliterate or close it. Sometimes a heated needle is used for the purpose. The best plan of all is to pass a current of electricity through the needle after it has been inserted into the follicle. Galvanic electricity is necessary for this purpose. The last method of treatment can be employed only by a skillful physician.

Fig. 349.

BALDNESS.

There are two varieties of baldness, the ordinary form, and what is known as "patchy baldness," a form in which the hair is lost only in circumscribed spots. The loss of hair usually begins first at the temples, the forehead, or the crown, gradually extending. It is very common in old age, being the result of the general decline in nutrition which occurs in advanced life. When it occurs in early or middle life, it most commonly results from the disease of the scalp known as dandruff (page 1271). Baldness also results from eczema and from ringworm and favus. Temporary baldness not infrequently follows erysipelatous, typhoid, and other fevers. Baldness may be occasioned by anything which deteriorates the general health. Excessive brain labor, resulting in congestion of the head and too much heat in the scalp, may produce it. It may be the result of dyspepsia, of excesses of various kinds, and of any debilitating disease. Men suffer more than women, which is probably due to the fact that women do not so habitually overheat the head by the constant wearing of warm head coverings. In some cases, the disease is hereditary.

Treatment.— Prevention is the best remedy, as many cases are in-

curable. The scalp should never be overheated. Head coverings should be light, and should allow free access of air to the head at all times. The hair should not be harshly brushed with a stiff brush, and should never be combed with a fine, sharp-toothed comb. This is particularly true if dandruff is present, as the measures referred to will certainly aggravate the difficulty. When the hair is very dry, a little fine unguent of some kind may be employed; but the common practice of "greasing" the hair is a bad one. Such harsh mixtures as are often employed by barbers in shampooing are very harmful to the hair. Soap should be rarely used unless of the finest quality, but the head should be kept clean by frequent washing with warm water, shampooing with the white of egg, followed by thorough rinsing.

When the scalp is smooth and shiny, especially in cases of "patchy baldness," which is due to nervous disease of the scalp, little can be expected from treatment. If a large number of hairs are still present, however, even though they are very short and thin, something may be done. The case is much more hopeful in young than in old persons. When hereditary, little can be expected from treatment. First attention should be given to the general health. The various stimulating lotions which are advertised for this purpose should be carefully avoided, as they will be rarely successful, and may do much harm. No amount of stimulation of the scalp will effect more than temporary benefit unless the general nutritive forces of the patient are also improved by attention to hygiene.

It is rarely necessary to cut the hair close, and shaving the scalp is quite unnecessary. If the scalp is dry, a little fine oil should be rubbed upon it daily with much gentle friction. If dandruff is present, treat as directed on page 1271. If the case is obstinate, consult a physician.

GRAY HAIR—CANITIES.

Loss of color of the hair is due to a failure of the papillæ to secrete the usual amount of coloring matter. A hair rarely loses its color; hence grayness, or loss of color, begins at the root of the hair.

Treatment.—There is no remedy but dyeing, and that is by no means always safe, since all the popular hair dyes contain lead or some other substance of a poisonous nature. Cases of lead poisoning from the use of hair dyes are by no means uncommon. The following

hair dye is recommended by the eminent Professor Hager, and may be used with perfect safety: Subnitrate of bismuth, one ounce; glycerine, fifteen ounces. Heat together in a water-bath for an hour. Add carefully a strong solution of caustic potash, while stirring the solution, until it becômes clear. Then add a very strong solution of citric acid until the test paper shows the mixture to be nearly neutral. Add sufficient rose or orange-flower water to make two pints. Color slightly with aniline, as desired.

DISEASES OF THE MALE GENERATIVE ORGANS.

INFLAMMATION OF THE PROSTATE GLAND—PROSTATITIS.

SYMPTOMS.—Pain and heat in the fork of the thighs, with tenderness on pressure; pain increased by urination, and by moving of the bowels; bearing down feeling in the bladder and the rectum; a hard slight swelling felt in the fork of the thighs and rectum; may be retention of urine.

Causes.—May result from taking cold, from sexual excesses, from the use of diuretics, and from disease of the rectum. The most common cause is gonorrhœa, or clap.

Treatment.—Hot fomentations to the perinæum; hot enemas three or four times a day or frequent cold enemas. When inflammation is high, as indicated by severe throbbing pain, cold enemas should be retained as long as possible. The patient should have a very simple diet, should take no meat, eggs, or condiments of any kind. Alcoholic liquors of all sorts should also be carefully avoided. The patient should maintain perfect quiet in bed so as to lessen the danger of permanent injury.

ENLARGEMENT OF THE PROSTATE.

SYMPTOMS.—Hard lump to be felt in the fork of the thighs, or rectum, at the base of the bladder, which is sensitive to pressure; slow, difficult, and painful urination; in many cases, symptoms of bladder disease.

The body situated at the base of the bladder, the so-called prostate gland, is now well understood to be not a gland at all, but a mass of muscular fibres which surround the seminal ducts and by contraction expel the seminal fluid. When often stimulated to contraction by excessive sexual indulgence or by self-abuse, hypertrophy, or overgrowth of the muscular body, takes place. Enlargement may also result from inflammation. It is a very common disease in old men, to whom it occasions very great inconvenience by producing painful and difficult urination, and in some cases actual retention, making the use of the catheter necessary. It is a difficulty which is often neglected, very much to the detriment of the patient.

Treatment.—Free water-drinking, careful avoidance of alcoholic

liquors, strong tea and coffee, tobacco, the use of condiments and stimulating foods of all kinds, and a diet consisting chiefly of fruits and grains, are the principal hygienic measures to be adopted in this disease. Hot fomentations applied to the perinæum daily, together with injections of hot water into the rectum in quantities from a pint to a quart, are the best means for diminishing the hardness and enlargement. The water employed for the injection should be as hot as the patient can bear; and the temperature may be 102° to 106° at first, and increased to 110° if possible; a prolonged hot spray to the perinæum is still more effective than fomentations. The spray may be employed with hot and cold alternations with good effect. If the trouble is not relieved quite promptly by the simple means suggested, the case should be brought to the attention of a skillful surgeon.

BALANITIS.

SYMPTOMS.—Heat and itching at the end of the penis; a creamy discharge; red and raw patches on the surface of the mucous membrane.

Causes.—The principal cause of this disease is lack of proper cleanliness. It occurs most frequently in persons having a long or tight foreskin; the disease corresponds to vulvitis in females; it is also occasioned by mechanical irritation and by gonorrhœa.

Treatment.—Careful washing and drying the affected parts three or four times a day will speedily effect a cure in the majority of cases. If there is considerable swelling, a cold compress should be applied continually. If the disease is somewhat obstinate, a solution of alum or sulphate of zinc, in the proportion of a grain or two to an ounce of water, may be applied once a day. The cure will also be facilitated by the use of carbolic acid ointment made by mixing ten drops of carbolic acid with an ounce of vaseline. For a radical cure, circumcision, or an equivalent surgical operation, is necessary.

CATARRH OF THE URETHRA—URETHRITIS.

SYMPTOMS.—Swelling and redness at the external end of the urethra; burning along the urethral canal, especially during urination; slight mucous discharge before or after urination; sticking together of the lips of the mouth of urethra.

This disease often occasions great anxiety and serious trouble from its similarity to a slight attack of gonorrhœa.

Causes.—Irritation of the urethra by foreign bodies as by the

awkward use of the sound or catheter, or by irritating injections into the urethra; sexual excesses, especially self-abuse; very frequent nocturnal emissions; coitus during menstruation.

Treatment.—This disease generally recovers of itself within a few days, though it sometimes continues for several weeks, especially when the anxiety of the patient leads him to frequently squeeze or press the organ to ascertain the presence of the discharge. Cool sitz baths and local douches should be daily employed. If there is considerable pain, the hot douche or spray is the best means of relief. Sexual indulgence should be entirely abstained from. The patient should avoid condiments, tea, coffee, tobacco, alcoholic liquors, and all other irritating causes. A competent physician should be consulted.

Gonorrhœa.—This disease does not differ from the preceding except in its contagious character and greater severity. The treatment of the disease consists in complete rest in bed for a few days, avoidance of exposure to cold, and the same measures as recommended for simple catarrh of the urethra. Severe cases require the attention of a physician. The results of neglected or badly treated gonorrhœa are sometimes most serious and life-long in character.

PRIAPISM.

***SYMPTOM.**—Constant and often painful erection.*

This condition is almost the invariable result of sexual excess of some sort; it frequently results from masturbation, the direct cause being the irritation produced by too frequent local excitement. Priapism often accompanies disease of the brain and nervous system.

Treatment.—In cases in which it does not arise from the causes last mentioned, one of the most essential elements of treatment is mental control. Indulgence in sensual thoughts is one of the most common causes of this humiliating disease. The best means of local treatment are the local application of cold to the affected part, and hot fomentions applied to the sacrum. If the local application of cold is not effective, relief may sometimes be obtained by the hot douche or spray taken at as great a heat as can be given without injuring the tissues.

INFLAMMATION OF THE TESTICLE.

***SYMPTOMS.**—Pain and sensation of weight in the testicle; pain extending up the cord; uneasiness in the lower part of the back and the groin; swelling of the testicle; scrotum full and tense; cord swollen and sensitive to pressure; slight fever; frequent urination; constipation; nausea and vomiting.*

This disease is generally caused by dissipation or by the extension of a gonorrheal inflammation from the penis to the testicle.

Treatment.—Rest in bed with fomentations to the affected part are the best measures for relieving pain; some surgeons advise the application of adhesive straps in such a manner as to compress the inflamed testicle. This seems to us to be an unnecessary procedure, as the same results can be obtained without, and with less pain to the patient and no risk of injury. The bowels should be well kept open by enemas. In case the patient should have much fever, cool sponge baths, and perhaps wet-sheet packs, should be employed. The testicles should be supported by a suspensory bag for some time after the acuteness of the inflammation has subsided, in order to prevent a relapse and to prevent the disease from becoming chronic.

NOCTURNAL EMISSIONS—SEMINAL LOSSES—EXHAUSTED VITALITY.

Seminal emissions occurring during sleep, usually accompanied by erotic dreams, are known as nocturnal or night pollutions, losses, or emissions. In addition to its characteristic feature, the disease is often accompanied by a long train of symptoms which are intimately connected with the local affection, or grow out of the debility arising from the continual drain upon the system, for a full account of which the reader is referred to the author's work entitled, "Plain Facts for Old and Young."

This disease is usually the result of self-abuse, but may result from sexual excesses of any kind. It is common in married men who have abused the marriage relation, when they are forced to temporary continence from any cause. It also occurs in those addicted to mental unchastity, though they may be physically continent. It is not probable that it would ever occur in a person who had been strictly continent and had not allowed his mind to dwell upon libidinous imaginations. In many cases such a condition of weakness and local debility is reached that an emission is produced by the slightest excitement. Mere proximity to a female, or the thought of one, may be sufficient to produce a pollution, attended by voluptuous sensations. But after a time the organs become so diseased and irritable that the slightest mechanical irritation, as friction of the clothing, the sitting posture, or riding horseback, will produce a discharge which may or may not be attended by sensation of any kind. Frequently a burning or more or less painful

sensation occurs; erection does not take place. Even straining at stool will produce the discharge, or violent efforts to retain the feces when there is unnatural looseness.

Treatment.—In cases in which the disease is of short duration, a cure can generally be effected quite readily; in those of longer standing, the task is more difficult, but still the prospect of recovery is very favorable, provided the co-operation of the patient can be secured; without this, little can be done. But in these cases the patient may as well be told at the outset that the task of undoing the evil work of years of sin is no easy matter. It can only be accomplished by determined effort, by steady perseverance in right doing, and in the application of necessary remedies. Those who have long practiced secret vice or other sexual excesses, or long suffered severely from the effects of sexual transgression, have received an injury which will inevitably be life-long to a greater or less extent, in spite of all that can be done for them. In such cases, a cure consists in reducing the frequency of the emissions so that the general health will not suffer, which point is generally reached when an emission occurs but once in four to six weeks.

In the attempt to cure this disease, the thing of first importance is that the patient should obtain command of his thoughts; by this means, he can do more for himself than all the doctors can do for him. "But I cannot control my thoughts," says the patient. A young man said to me, "O doctor, you don't know how I feel. I despise myself; I hate myself; I often feel inclined to kill myself. My mind is always full of abominable images; my thoughts run away with me and I cannot help myself." The tears ran down his face in streams as he told me of his slavery. All possible means must be employed to attract the patient's attention from himself, from brooding over his ills. Occupy him, interest him, or teach him to occupy and interest himself. The enthusiastic study of some one of the natural sciences is a most excellent auxiliary in effecting this.

Daily exercise should be taken to the extent of fatigue. It is better that those who are still strong enough should have some regular employment which will require exercise. Those who prefer may secure exercise and recreation in the pursuit of some study that involves necessary physical exertion; as, botany, geology, or entomology. The collecting of natural-history specimens is one of the most pleasant diversions, and may be made very useful as well. No single form of exercise

is so excellent as walking. Four or five miles a day are none too many to secure a proper amount of muscular exercise. Gymnastics, the "health-lift," "Indian clubs," "dumb-bells," rowing, and other forms of exercise are all good; but none of them should be carried to excess. Ball-playing is likely to be made a source of injury by exciting, in vigorous competition, too violent and spasmodic action.

Careful regulation of the diet is a matter of paramount importance. The science of physiology teaches that our very thoughts are born of what we eat. A patient that lives on pork, fine-flour bread, rich pies and cakes, and condiments, drinks tea and coffee and uses tobacco, can make no permanent improvement without reformation. The food must be simple and unstimulating. Much flesh-meat, condiments, tea, coffee, beer, tobacco, and all stimulants must be strictly avoided. It is better for the patient to eat but twice a day, and never later than three or four hours before bed-time.

Sufficient sleep should be taken, but dozing must be avoided. Never go to bed with the bowels or bladder loaded. The bladder should be emptied just before retiring. It is also a good plan to form the habit of rising once or twice during the night to urinate. The position in sleeping is of some importance. Sleeping upon the back or upon the abdomen favors the occurrence of emissions; hence, it is preferable to sleep on one side.

Various devices are employed, sometimes with advantage, to prevent the patient from turning upon his back while asleep. The most simple is that recommended by Acton, and consists in tying a knot in the middle of a towel, and then fastening the towel about the body in such a way that the knot will come upon the small of the back. The unpleasant sensations arising from pressure of the knot, if the sleeper turn upon his back, will often serve as a complete preventive. Others fasten a piece of wood upon the back for a similar purpose. Still others practice tying one hand to the bed-post. None of these remedies should be depended upon, but they may be tried in connection with other means of treatment. Soft beds and pillows must be carefully avoided. Feather-beds should not be employed when possible to find a harder bed; the floor, with a single folded blanket beneath the sleeper would be preferable. Soft pillows heat the head, as soft beds produce heat in other parts. A hair mattress, or a bed of corn husks, oat straw, or excelsior —covered with two or three blankets or a quilted cotton mattress— makes a very healthy and comfortable bed. Too many covers should

be avoided with equal care. The thinnest possible covering in summer, and the lightest consistent with comfort in winter, should be the rule.

As a curative means, the cool or cold sitz bath is one of the most efficacious of all remedies. It should be taken daily, and may often be repeated, with benefit, several times a day. Its effect is to relieve the local congestion, and thus allay the irritability of the affected parts. When but one bath is taken daily, it should be just before retiring at night. Other methods of treatment are described in our work devoted to this subject.*

Drugs are usually of little value, as the most they can do, at least in the great majority of cases, is to temporarily check the disease. Permanent recovery demands the strictest attention to improved hygiene. The employment of rings, pessaries, and numerous other mechanical devices for preventing emissions, is usually futile. No dependence can be placed upon them. Some of these contrivances are very ingenious, but they are all worthless, and time and money spent upon them are thrown away.

In conclusion, we would say to those who may have the misfortune to be suffering in this manner, Never consult a quack. The newspapers abound with lying advertisements of remedies for diseases of this character. Do not waste time and money in corresponding with the ignorant, unprincipled charlatans who make such false pretensions. Do not consult traveling doctors. Physicians of real merit have plenty of business at home. They are not obliged to go abroad in order to secure practice. Persons who resort to this course are, without exception, pretentious quacks. Consult only some well-known and reliable physician in whom you have confidence. It is far better to consult your family physician than to trust yourself in the hands of some one whom you do not know, and especially one who makes great pretensions to knowledge.

Treatment of Self-Abuse.—The method adopted must differ according to the age of the individual patient. In children, especially those who have recently acquired the habit, it can be broken up by admonishing them of its sinfulness, and portraying in vivid colors its terrible results, if the child is old enough to comprehend such admonitions. In addition to faithful warnings, the attention of the child should be fully occupied by work, study, or pleasant recreation. He should not

* "Plain Facts for Old and Young."

be left alone at any time, lest he yield to temptation. Work is an excellent remedy; work that will really make him very tired, so that when he goes to bed he will have no disposition to defile himself. It is best to place such a child under the care of a faithful person of older years, whose special duty it shall be to watch him night and day until the habit is thoroughly overcome.

In younger children with whom moral considerations will have no particular weight, other devices may be used. Bandaging the parts has been practiced with success. Tying the hands is also successful in some cases; but this will not always succeed, for they will often contrive to continue the habit in other ways, as by working the limbs, or lying upon the abdomen. Covering the organs with a cage has been practiced with entire success. A remedy which is almost always successful in small boys is circumcision, especially when there is any degree of phimosis. The operation should be performed by the surgeon without administering an anæsthetic, as the brief pain attending the operation will have a salutary effect upon the mind, especially if it be connected with the idea of punishment, as it may well be in some cases. The soreness which continues for several weeks interrupts the practice, and if it had not previously become too firmly fixed, it may be forgotten and not resumed. If any attempt is made to watch the child, he should be so carefully surrounded by vigilance that he cannot possibly transgress without detection. If he is only partially watched, he soon learns to elude observation, and thus the effect is only to make him cunning in his vice.

In adults or youths a different plan must be pursued. In these cases, moral considerations, and the inevitable consequences to health of body and mind, are the chief influences by which a reform is to be effected, if at all. These considerations may be urged with all possible eloquence and earnestness, but should not be exaggerated. The truth is terrible enough. If there are any special influences which may be brought to bear upon a particular individual,—and there always will be something of this sort, owing to peculiarities of temperament or circumstances,—these should be promptly employed and applied in such a manner as to secure for them their full bearing. But after all, the most must be done by the individual himself.

SPERMATORRHŒA.

This is really an advanced stage of the preceding disease, in which

seminal losses occur without the knowledge of the patient, as when straining at stool, or by passing off in the urine. It is almost invariably accompanied by an extreme degree of irritability of the urethra near the base of the bladder. The seminal fluid escapes in some cases just after urination in the form of a few whitish drops. It must not be supposed, however, that a discharge of this kind is always of a seminal character, as it is more often simply mucus. The real character of the discharge can be determined only by a careful microscopical examination.

Treatment.—All that the patient can do for himself has been indicated under the preceding disease. Cases of this kind require the attention of a skillful physician.

IMPOTENCE.

Impotence, or a lack of sexual power, may be due to a great variety of causes, among the chief of which are sexual excess, particularly self-abuse, mental influences, the use of liquor, opium, and particularly the use of tobacco. The influence of tobacco in producing this condition has been long suspected, and is now well recognized by many physicians. At a late meeting of the British Medical Association several eminent physicians reported several cases of impotence in which the disease was undoubtedly the result of tobacco-using. The first effect of the drug is to excite the sexual organs; the ultimate result of this morbid excitement, as stated, is partial or entire loss of sexual power.

Treatment.—When impotence is the result of long-continued sexual abuse, complete recovery is impossible; though even in the majority of these cases at least partial improvement can be secured. When the impotence is accompanied by nocturnal emissions or spermatorrhœa, these affections must of course be cured before sexual power can be regained. Treatment that is good for one of these conditions is also the best for the other. The patient should abstain from the use of all narcotics and stimulants, including tea, coffee, strong spices and other condiments, as well as tobacco and alcoholic liquors. It is necessary that he also refrain from any attempt to exercise the sexual functions, and avoid sexual excitement of all kinds. Every possible measure should be adopted for improving the condition of the general health. In addition, the alternate hot and cold douche or spray should be applied to the parts daily. Two or three times a week a local application of electricity should

be made. The latter measure is one of the best means of treatment we have ever employed. We have found the last-named remedy to be very essential in the treatment of bad cases of impotence. When this condition arises from moral influences, as lack of confidence, the remedy consists in the removal of the causes so far as possible by appropriate mental and moral treatment.

STERILITY.

This condition may arise from a great variety of causes, among which may be mentioned various diseases, as diabetes, Bright's disease, dyspepsia, consumption, as well as disease of the testicles, including varicocele and various tumors to which the organ is subject. In some cases sterility is due to obstruction of the seminal ducts, which may arise from stricture of the ducts from inflammation or failure of the testicles to descend from the abdominal cavity to the scrotum. The use of tobacco, opium, and alcoholic drinks, should also be recognized as a cause of sterility. All of these drugs destroy the vitality of the spermatozoa, the essential elements of the seminal fluid.

Treatment.—The treatment of this condition wholly depends upon the cause. When this is of such a nature that it can be removed, recovery may take place. Cases in which there is permanent closure of the seminal duct are usually incurable. Real sterility is six times as frequent in women as in men.

NEURALGIA OF THE TESTICLE.

Under this head are included two conditions, in one of which there is unnatural sensitiveness to touch or pressure, and the other in which there is constant pain of a neuralgic character, sometimes very distressing. The pain is most often of a dull, aching character, and frequently extends up the cord to the body. In some cases the neuralgic pains extend to the inner portion of the thigh, upon the side in which the disease exists. It may originate from any one of the following causes: self-abuse and other sexual vices and excesses, disease of the prostate, inflammation of the testicle, acid urine, dyspepsia, gout, varicocele. The last-named disease is almost invariably accompanied by neuralgia.

Treatment.—Recovery will generally take place quite speedily when the causes of the disease are removed. The pain is generally relieved by local applications of cold. Cold applications to the lower part of the back are especially useful, and should be employed in the form of

an ice-pack, and may be used from one to three hours a day according to the urgency of the case. Applications of dry heat or of the hot spray will also be found useful in relieving local pain.

TUMORS OF THE TESTICLE.

The testicles are subject to fibrous and cancerous growths, as well as various other kinds of tumors. The only remedy to be recommended in these cases is removal of the affected organ.

SYPHILIS—POX.

Of the three forms of venereal disease, this is of vastly greater consequence than either of the other two, gonorrhœa and chancroid, since this is a constitutional affection, while they are purely local in character.

The symptoms of this disease are too numerous for full consideration here, and we can only notice some of the chief features of the disease. It has three distinct stages. The first is a local manifestation, known as *chancre*. Two or three weeks, or longer, after exposure, a small, hard, reddish pimple makes its appearance, usually upon the genitals, although cases have occurred in which the disease was contracted by kissing, when the chancre was formed upon the lip. The pimple increases in size for a few days, and finally ulcerates, and discharges slightly. It does not usually give much inconvenience, and is, in fact, not infrequently unnoticed. In this respect the chancre differs much from the chancroid, a very important distinction. After a few days the glands of the groins become somewhat enlarged, although not very painful. After one to three months the secondary stage of the disease appears, as an eruption of red spots, which are followed by pimples. After a time, larger pimples or pustules make their appearance, leaving behind them pock marks like those of small-pox. Ulcers also appear in some cases. Simultaneously with the occurrence of the eruption, slightly raised spots of a whitish color, known as *mucous patches*, appear on the mucous membrane of the lips and tongue. A slight discharge arises from these patches, which is of a very contagious character. The patient also has sore throat, and often sore eyes; and after the general health has become considerably impaired, suffers greatly with pains in the head, arms, legs, breast, and particularly in the joints, though the pain is not confined

to them as in rheumatism. Small swellings, known as *nodes*, which are tender on pressure, appear on the shins and other parts.

The above symptoms disappear after a few weeks, and the patient may seem to be well for several months or years; but unless the disease has been properly treated, it is all the time at work in the system, and next makes its appearance in the deeper tissues, particularly in the bones and cartilages of the nose and skull. Not infrequently the nose is greatly disfigured, or even wholly destroyed. The liver, lungs, kidneys, heart, and other internal organs, are also likely to be affected. No other disease makes such fearful ravages in the human constitution as this.

Treatment.—There is a great difference of opinion among physicians concerning the treatment and the curability of this disease. The eminent Prof. Van Buren, of New York, who has had a very extensive experience in the treatment of this affection, stated in our hearing, a few years ago, that he never dared to assure a patient that he was well, no matter how completely free from disease he might seem to be. Others claim to be able to effect a cure in nearly all cases. Mercury has been looked upon as the great antidote for syphilis; but as shown elsewhere (see pages 764–6), there are grounds for doubting the efficacy of this drug. According to Prof. Hughes Bennett, M. D., F. R. S. E., President of the Royal Medical Society of Edinburgh, the mercurial treatment is being rapidly superseded by the "simple" method, which consists in careful regulation of all the habits of the patient, good hygiene, avoidance of spices, condiments, meat, and all stimulating foods, and the use of tepid baths and other eliminative treatment. Two or three full baths may be taken daily with advantage, unless the patient is very weak. The vapor, hot-air, Turkish, and Russian baths are also useful. The wet-sheet pack is a very admirable remedy. Fomentations and tepid compresses should be applied to irritable parts. The patient should drink from one to two quarts of water daily. By these means the poison may be eliminated from the system; while by the mercurial treatment, according to Dr. Bennett and several other eminent German physicians, the manifestation of the disease is only checked, thus merely delaying the expulsion of the poison from the system. With reference to the success of this mode of treatment Dr. Bennett remarks: —

"More than eighty thousand cases have been submitted to experi-

ment, by means of which it has been perfectly established that syphilis is cured in a shorter time, and with less probability of producing secondary syphilis, by the simple than by the mercurial method." The same author further remarks: "The intensity of the disease in modern times has declined exactly in proportion as its treatment by mercury has diminished, and the disorder been left to follow its natural course."

In order to be effectual, the treatment must be continued for months after the symptoms of the disease have disappeared, as the malady may appear even after the lapse of many years, and if not in the lifetime of the transgressor, may appear in his posterity.

CHANCROID.

This is a painful ulcer, or sore, which secretes a contagious matter, usually appearing upon the genitals within a few days after exposure. If not properly treated, these sores often last several months. There may be several present at the same time. In many cases, a painful swelling occurs in the groin, on one side or on both, from enlargement of the glands in this region. The swelling may disappear by absorption, or suppurate and form an abscess. This form of venereal disease does not give rise to constitutional symptoms.

Treatment.—Keep the sore clean, employ a restricted diet, practice absolute continence, and refrain from active exercise for a few days. Meat, stimulants, spices, and tobacco, should be carefully avoided. The specific poison may be destroyed by touching the sore with a strong caustic of some sort. A physician should be consulted.

DISEASES OF WOMEN.

A remarkable increase in the number and frequency of that large class of maladies known as diseases peculiar to women, has attracted the attention of many observing physicians. The fact has received many different explanations. One author attributes the difficulty to faulty methods of education, particularly the attempt of young women to compete with their brothers in the study of the classics and the higher mathematics. Another, adducing the fact that American women seem to suffer more than those of any other nation, finds an explanation in the asserted fact "that all animals tend to deteriorate in this country." No reason is offered why America should not be as healthy a country as any other upon the globe, but attention is called to the fact that numerous classes of people have occupied the territory in succession, from which it is argued that no race can long continue an existence here without degeneration; thus placing the responsibility wholly upon nature and removing it from the shoulders of those who, according to our view, are only suffering the consequences of their own transgression of nature's laws, combined with inherited weakness and morbid tendencies.

We have become satisfied from the somewhat extended opportunities of observation which we have enjoyed, that the causes of the increased frequency of diseases peculiar to the female sex are more directly attributable to bad habits of dress, diet, and unnatural and injurious personal and social habits of various sorts, than to any other causes. We cannot conceive it to be possible for a woman to dress in accordance with the requirements of fashion for any length of time, without becoming seriously diseased in the functions peculiar to her sex.

The process of perversion which finally results in serious disease, begins at a very early period. In the words of the eminent Prof. Emmet, who stands foremost in the ranks of specialists in the treatment of this class of diseases, "at the very dawn of womanhood the young girl begins to live an artificial life, utterly inconsistent with the normal development. The girl of the period is made a woman before her time by associating too much with her elders, and in diet, dress, habits, and

tastes, she becomes at an early age, but a reflection of her elder sisters. She may have acquired every accomplishment, and yet will have been kept in ignorance of the simplest feature of her organization, and of the requirements for the preservation of her health. Her bloom is often as transient as that of the hot-house plant, where the flower has been forced by cultivation to an excess of development, by stunting the growth of its branches, and limiting the spread of its roots. A girl is scarcely in her teens before custom requires a change in her dress. Her shoulder-straps and buttons are given up for a number of strings about her waist, and the additional weight of an increased length of skirt is added. She is unable to take the proper kind or necessary amount of exercise, even if she were not taught that it would be unladylike to make the attempt. Her waist is drawn into a shape little adapted to accommodate the organs placed there, and as the abdominal and spinal muscles are seldom brought into play, they become atrophied. The viscera are thus compressed and displaced, and as the full play of the abdominal wall and the descent of the diaphragm are interfered with, the venous blood is hindered in its return to the heart."

Although mothers have been repeatedly warned of the danger of thus allowing their daughters to sap the very foundation of their life in early womanhood, it is rare indeed that a mother can be found who has the moral courage to stand up against the tide of public opinion and bravely refuse to bow to the mandates of fashion. Health, happiness, usefulness, comfort, are all sacrificed upon the throne of the fickle goddess to whom so many thousands pay an onerous but willing homage. So long as this strangely inconsistent course is persisted in, woman will continue to be the chief supporter of the medical fraternity, whose skill and ingenuity are taxed to the utmost in devising means for the relief of her multitudinous and painful ills; at least three-fourths of which might be easily avoided by better attention to the laws which govern her sexual nature.

Among other general causes of disease in woman may be mentioned novel reading, an evil habit indulged in by a very large proportion of the young ladies of the present day, and the result of which is the development of a weak sentimentalism, and the production of nervousness, hysteria, and a long list of maladies which depend largely upon morbid mental states.

Another very frequent cause which should be mentioned in this connection, is carelessness at the menstrual period. Few women, at least

in early life, exercise that care at this time that is absolutely necessary to avoid incurring danger of producing serious disease. Young women attend parties, concerts, balls, and various entertainments in all sorts of weather, and without proper attention to protection by suitable clothing, irrespective of the menstrual function, the consequence of which is the contraction of colds at this susceptible period, and the establishment of various irregularities which lay the foundation for serious diseases in future years. There is no doubt but that a large share of the chronic diseases from which women suffer the most, have their first beginnings in exposure at the beginning of sexual activity. The greatest care should be exercised at the time of the establishment of the menstrual flow on this account. At least twenty-four hours' rest should be taken before the time for the period to begin. The most of the time during the period should be spent in bed. No violent physical or mental exertion should be indulged in at this time. Women of barbarous nations, and robust young women who have from early childhood been accustomed to active muscular labor, perhaps do not require to observe quite so great precaution; but the average girl of the present day needs just this sort of care. Mothers are generally very remiss in their duty in not watching carefully over their daughters at this period, giving them proper instruction and restraining them from taking such a course as must result in positive and often life-long injury.

Another active cause in the production of local diseases in women is habitual neglect of the bowels. The great majority of women, young, old, and middle-aged, suffer with constipation of the bowels. In a majority of cases this is largely the result of neglect to attend promptly to the calls of nature. By degrees, the bowels lose their natural sensibility, and become torpid and inactive; the immediate result of this is congestion of all the organs of the pelvis, the uterus and ovaries with the rest, and sooner or later the symptoms of disease of these organs make their appearance.

Lastly, we must mention sexual abuses of various sorts as among the most positive sources of serious local disease in females as well as in the opposite sex. Probably this cause, especially secret vice among young women, does not prevail to such a universal extent as it does among boys and young men.

Incurable disease of the Fallopian tubes is a very common result of inflammation following childbirth. Inflammations of this sort are much more likely to result from miscarriage, especially when pur-

posely or artificially induced, than from natural labor, and is one of the causes of the frequent sterility which follows criminal abortion, disease of the tubes from taking cold at the menstrual period, and from injuries to the pelvic region of the body. Recent researches have shown that incurable diseases of the tubes whereby sterility is induced in women, are not infrequently the result of infection from husbands who, before marriage, had suffered from gonorrhea, and at marriage have supposed themselves to be cured, but have infected their wives in consequence of the survival of the disease in a latent form.

Careful study of the diseases of women during more than twenty years, and observation of many thousand cases, have convinced the writer that women suffer less from diseases peculiar to their sex than is generally supposed. There is a very small proportion of back aches of which women complain which are really due to diseases of the ovaries. Ulceration, hemorrhoids, constipation of the bowels, especially prolapse of the stomach, liver, spleen, kidneys, and bowels, are the most common causes of backache in women. An examination of the abdomen in these cases shows, most commonly, excessive sensitiveness of the abdominal sympathetic nerve. Backache is much more likely to be relieved by the application of the abdominal bandage (the Natural Abdominal Supporter, see Appendix), than by the employment of pessaries. A large share of the suffering of women may be corrected by comparatively simple remedies, provided the cause is removable. The abdominal bandage, of course, affords only temporary support, and should be supplemented by strengthening of the abdominal muscles by massage, electricity, gymnastic exercises, etc. (See "The Art of Massage," by the author, published by the Modern Medicine Publishing Company, Battle Creek, Mich.)

In cases in which structural and painful diseases of the ovaries exist, an operation for removal of these organs, either alone or together with diseased tubes, is necessary, and such operations are usually followed by most brilliant results in the restoration of chronic invalids to health. The operation is, of course, a most critical one, but in the hands of a skilled surgeon the mortality is very small. We believe, however, that surgical measures are resorted to in a much too large proportion of these cases. We have succeeded in curing by far the greater share of cases of this sort which have come under our care, without surgical means.

INFLAMMATION OF THE OVARY.

SYMPTOMS.—Sudden pain in one or both groins, sometimes extending down the leg to the feet; often pain in the breast and the affected side; increase of pain during menstruation; tenderness on pressure; pain in moving the bowels; general distress; nausea; more or less fever.

This disease most frequently results from taking cold during menstruation, from injury, and from the infection of gonorrhœa. In many instances innocent wives have suffered from inflammations which have rendered them barren and invalids for life by the last-named disease contracted from incontinent husbands.

Treatment.—Rest, fomentations to the affected part, hot vaginal douches two or three times a day, and especially the hot enema taken once or twice a day and retained for half an hour or as long as possible. The patient should remain perfectly quiet in bed, and should not attempt to get upon her feet or walk about for some time, or until the local irritation is almost wholly subdued.

CONGESTION OF THE OVARY—OVARIAN IRRITATION.

SYMPTOMS.—Tenderness in the groin; pain in standing or walking; more or less continuous pain, aggravated at the menstrual period, which is generally ushered in by a chill followed by a fever resembling that of ovarian inflammation.

This condition is frequently called chronic inflammation of the ovary, and is often accompanied by enlargement of the organ which in consequence of some sudden jar or unusual strain becomes dislocated or prolapsed. Ovarian irritation often produces a reflex effect upon the system. It is a frequent cause of obstinate dyspepsia, especially of the nervous form, accompanied by spinal irritation, by painful headaches, and in some cases of serious mental disease amounting to insanity.

Causes.—Among the chief causes may be mentioned improper dress, taking cold at the menstrual period, disappointment, induced abortion, the use of "preventives," constipation, the opium habit, prostitution, and self-abuse.

Treatment.—The patient should be given the advantage of as good hygienic surroundings as possible. Sun baths, massage, complete rest at the menstrual period, daily fomentations over the affected parts, the daily use of the hot vaginal douche, the hot enema, fomentations over the lower part of the spine, and the local application of electricity constitute the best known means of treatment. The sinusoidal electrical

current is an exceedingly valuable means in these cases. Pelvic massage in the hands of a skillful physician sometimes gives most marvelous results. Building up the whole system by gymnastic exercises and manual Swedish movements is also curative. Mental and physical chastity are indispensable conditions of recovery. Removal of the ovaries is sometimes practiced, but this is rarely needed, if the patient can have the benefit of the treatment suggested.

OVARIAN TUMOR.

SYMPTOMS.—Begins with dull pain low down on one side of the body; scanty menstruation, and finally suppression; dragging pain in the bowels; painful and frequent urination; difficulty in moving the bowels; great debility; loss of flesh; enlargement begins on one side of the body.

Ovarian dropsy consists in the formation of a cyst in the ovary which gradually enlarges until it attains in some instances of very great size, and is filled with fluid which differs in character in different cases. The ovary is also subject to the growth of various other tumors, as fibrous and cancerous tumors. Ovarian dropsy generally runs its course in about four years. The causes are obscure. The difficulty is probably occasioned in many instances by inflammation of the ovary.

Treatment.—The medical treatment of ovarian dropsy consists in withdrawing the fluid by means of tapping, or preferably by the use of the aspirator, the employment of galvanism and electricity in other forms, and improvement of the patient's health in every possible way. In a case which we had under treatment a few years ago, the tumor had obtained such enormous size as to give to the patient, naturally a very slight woman, a waist circumference of over forty-four inches. The plan of treatment in this case was removal of the fluid by means of the aspirator, followed by the application of a strong galvanic current over the affected part. The result was that the patient was able to leave for her home after six or eight weeks' treatment without the slightest trace of any disease; and when we met her a year later, she continued well.

The only radical cure for the disease, however, is ovariotomy, a surgical operation by means of which the diseased ovary, with the cyst attached to it, is removed. This is a comparatively recent procedure, and is one of the most brilliant operations of modern surgery. When the operation was first employed, a very large proportion of those operated upon died; but so many improvements have been made since that time

that skillful operators have now reduced the risk of death to even less than three in one hundred. An American operator has recently reported a series of 165 cases of operation for removal of diseased ovaries, ovarian tumors, etc., without a single death. A celebrated English operator recently performed the last of one hundred successive cases without a single death.

INFLAMMATION ABOUT THE UTERUS, ETC.

SYMPTOMS.— Fever; pelvic pain; small, wiry pulse; nausea and vomiting; tenderness on pressure just above the pubic bone; painful urination and defecation; profuse menstruation.

Inflammations of this sort are much more common than is generally supposed, and are usually very serious in their results. There is a strong tendency to the formation of abscesses. Another serious complication is the inflammation of the broad ligament, which subsequently contracts, thus becoming shortened. This kind of shortening is a common cause of lateral displacements of the uterus.

Causes.— Inflammation following childbirth, abortion, taking cold during the menstrual period, inflammation of the ovary, gonorrhea, the use of caustics upon or in the uterus, wearing of ill-fitting pessaries, sexual excesses; these are the most common causes.

Treatment.— An acute attack can generally be checked by a sufficiently thorough and energetic course of treatment. Keep the patient perfectly still in bed. If the fever is high, apply the ice-cap with ice compresses or bags filled with ice-cold water to the spine. The most effective measures of treatment, however, are the hot vaginal douche and the hot enema. These should be given with great thoroughness. The douche should be taken for an hour at a time, and should be repeated three or four times a day, or it may be given continuously for several hours. This is the most reliable means known for cutting short an inflammation after it has begun. Hot applications should be made to the feet to balance the circulation. The hot blanket pack, as a means of inducing perspiration, is an excellent measure in this disease, as it relieves the congestion of the internal organs. Chronic cases requre the persistent use of fomentations over the lower abdomen, hot douches two or three times a day, with rest in bed and complete functional rest of the affected organs. Attention should be given to the improvement of the general health by means of a good diet, massage, the use of electricity in various forms, etc. We have thought that the absorption of the hardened

mass felt after an attack of this sort has been in many cases stimulated very greatly by the local use of galvanism. Care should be taken, however, to avoid the employment of too strong currents. In one case which had been under treatment for some months, with very great benefit, though the patient was not entirely cured, the lady became somewhat impatient because we refused to employ as strong currents of electricity as she wanted, and resorted to another physician who made a speciality of the use of electricity. She received from this source the strong current she desired, but the result was most disastrous, as an inflammation was set up which obliged her to return to us, and which we had much difficulty in subduing.

AMENORRHŒA.

Amenorrhœa is a condition in which the regular monthly flow is suspended. It is not a disease of itself, being simply a symptom of some disorder of the uterine organs. The conditions from which it may arise are various. In pregnancy, menstruation is usually suspended, although in exceptional cases the regular monthly flow continues. There is some discussion, however, whether in these cases the loss of blood is the true monthly menstrual flow. Menstruation is also usually suspended during nursing, although the function is not infrequently resumed two or three months after childbirth. Imperfect development of the reproductive organs and obstruction of the uterus or the vagina are conditions which occasionally give rise to amenorrhœa. When a mechanical obstruction exists, there is generally enlargement of the abdomen from accumulation of the menstrual fluid. Sudden suppression of menstruation is generally due to taking cold during the menstrual period, or sudden mental shock. When it occurs suddenly in this way, the patient generally complains of pain in the back, headache, fever, and other unpleasant symptoms. We have noticed also, in some cases, temporary suspension of the menstrual flow in consequence of a change in diet, in which persons who had been accustomed to a stimulating diet, consisting largely of animal fat, including a free use of stimulating condiments, suddenly discontinued the use of these articles. In these cases, however, we have never observed any impairment of the general health ; in fact, in the majority of cases there has been improvement in the general health notwithstanding the suppression of this function. In the course of a few months the function appears again, though as a general rule the flow

is somewhat less profuse than before. We have observed a few peculiar cases of suppression of menstruation in which the patient suffered at the times when menstruation should appear, with peculiar nervous symptoms closely resembling a slight epileptic attack.

Patients suffering with amenorrhœa are frequently subject at the time when the menstrual flow should make its appearence to hemorrhage in various parts of the body, as from the nose, lungs, stomach, bowels, etc. Some cases have been observed in which bloody-sweat appeared at these times. These hemorrhages are sometimes termed vicarious menstruation.

Treatment.—In cases in which the function has never appeared, the difficulty is generally due to morbid development or some form of obstruction. For the first condition, such measures should be adopted as will improve the patient's general health, and secure proper development. In these cases, the hips are generally narrow and the breasts small, and the patient has in many cases something of a masculine appearance. When the difficulty has existed for a long time, its removal may be impossible; hence the importance of giving attention to the matter in time. When obstruction exists, as indicated by the periodical occurrence of the usual symptoms of menstruation, but without the menstrual flow, and with enlargement of the lower part of the abdomen, surgical measures should be resorted to, to allow the accumulated fluid to escape. This should be done gradually, however, and in such a way as to prevent the entrance of air, as otherwise decomposition would occur, which might result in poisoning of the blood. This class of persons often suffer much mental annoyance through suspicion of pregnancy.

In cases in which suppression occurs suddenly during the menstrual period, the patient should take a hot foot or sitz bath, or better still, a hot blanket pack, and should be made to sweat profusely by this means combined with hot drinks. Hot fomentations should be applied across the lower part of the bowels, bricks, hot bags, and other similar applications to the limbs and inside of the thighs. Ice-bags or compresses should be applied over the lower portion of the spine, and the patient should be kept quiet in bed.

When amenorrhea exists in consequence of debility or anemia, as in consumption and other prostrating diseases, attention should be given to the improvement of the general health by nutritious food,

daily exercise in the open air, daily massage, with inunctions, electricity and other tonic measures. In these cases, the amenorrhœa is not to be considered as the cause of the existing debility or general disease, as is usually thought to be the case. It is simply the result of general depression of the system which will disappear with the removal of the cause. In these cases, warm sitz baths, hot fomentations over the bowels, and daily application of the ice compress to the lower portion of the spine for an hour or two, are useful measures. The local application of electricity by a competent person is also of very great advantage.

Scanty Menstruation.—The length and quantity of the menstrual flow varies very greatly in different individuals within the limits of life. A person suffers with scanty menstruation when the function is meager compared with what is usual for the same individual.

The principal causes of this condition are consumption, inflammation of the ovaries, ovarian tumors, anteflexion of the uterus, mental depression, chlorosis, and general debility.

Treatment.—The general treatment should be the same as recommended for similar cases in which menstruation is entirely suspended. For a few days before the period should make its appearance, the patient should take daily a warm sitz-bath for fifteen or twenty minutes. At the time of the period, warm enemas and cold compresses applied to the lower part of the spine, with fomentations over the bowels at the same time, constitute the best measures of treatment. The difficulty will generally exist until the patient shows marked evidences of improved health. Electricity and pelvic massage are also useful.

MENORRHAGIA—PROFUSE MENSTRUATION.

The same remarks made respecting the preceding condition apply to this. There is no definite standard as to the length or quantity of the menstrual flow. When the flow is much more than usual, or so excessive as to produce weakness and prostration either at the time or after, it may be termed menorrhagia.

Menorrhagia may be produced by either plethora or debility. When resulting from plethora, the patient suffers with severe throbbing headache, pain in the back, and general symptoms of fever. When it results from the opposite condition, the patient is very weak, pale, and thin in flesh, and the flow is almost continuous, one period begin-

ning almost immediately at the conclusion of the other. In addition to plethora and debility, menorrhagia may be the result of chronic congestion of the uterus, prolapsus and other displacements, tumors, laceration of the neck of the uterus, disease of other organs, and vegetations.

Treatment.—In cases of menorrhagia arising from plethora, the diet should be simple and plain. The patient should take but two meals a day, and little or no meat. Abundant out-of-door exercise is also essential; great advantage may be derived from the use of packs, vapor baths, hot-air baths, and other eliminative treatment, until the symptoms of plethora disappear. Daily cold sitz baths between the periods are also advantageous. At the time of the period, and about twenty-four hours before it is expected, the patient should have complete mental and physical rest in bed. Cold cloths should be applied over the lower part of the abdomen and between the thighs. A cold or cool enema should be given two or three times a day. Cold should should not be applied for more than an hour or two at a time without allowing an interval of half an hour.

In patients who are pale, debilitated, and have but little blood, energetic measures are often needed. The patient should observe the directions just given respecting quiet. Cold applications should be made to the lower part of the bowels, being replaced once in twenty or thirty minutes by a hot fomentation for three or four minutes, cold being then applied again. The cold enema and often the cold vaginal douche are indicated when the flow is extremely profuse. The hot vaginal douche is also useful.

In a great majority of cases of menorrhagia there exist small growths within the uterus known as vegetations. The most effective means of treatment is scraping out by the curette, or curettement, with a subsequent application, once or twice a week, of electricity in the form of positive electrolysis.

For temporary relief, the best method is the hot alum douche or alum pack. The hot alum douche is the same as the ordinary hot water douche, with the addition of a heaping tablespoonful of powdered alum to a quart of water.' The alum pack consists of application about the cervix of equal parts of powdered alum and subcarbonate of bismuth, the powdered mixture to be held in place by pledgets firmly packed about the neck of the womb.

METRORRHAGIA — UTERINE HEMORRHAGE.

This is a hemorrhage occurring from the uterus at other times than at the menstrual period. The causes are essentially the same as those described as occasioning menorrhagia.

Treatment.—Keep the patient quiet in bed; apply cold over the bowels and between the thighs; administer cold enemas and cold vaginal injections. In case the hemorrhage is severe, much may be gained by tying a band tightly around one or both lower limbs, thus retaining in the legs a large amount of the venous blood. The ligature should not be retained long enough to do harm, and should be gradually removed if the limbs should become considerably swollen and purple. Compression may also be practiced by means of a pad composed of a folded towel placed over the womb. In severe cases it often becomes necessary to plug the vagina. This is best done by means of moist cotton. The cotton should be saturated with water and squeezed as dry as possible. It should then be soaked for a few seconds in a strong solution of alum and again squeezed dry. It should then be made into a number of small rolls of a size convenient for introduction, and after tying a string ten or twelve inches in length around the center of each, they should be passed into the vagina and crowded up around the neck of the uterus as tightly as possible. The whole neck of the womb should be surrounded, and the vagina should be packed as full as possible. Care should be taken that no spaces are left between the different portions of cotton, and that the whole mass is made as compact as possible. This is generally known as tamponing the vagina. The operation cannot be thoroughly done without the aid of a speculum, and hence a physician should be called in every case of uterine hemorrhage sufficiently severe to require this mode of treatment. Persistent hemorrhage also demands a thorough examination by a competent physician to ascertain the real cause of the difficulty in order to adopt the proper measures for permanent relief. Curettement and other measures recommended for hemorrhagia are still more applicable to metrorrhagia; in very severe cases packing the womb with antiseptic gauze is required. This can be done only by a qualified physician.

DYSMENORRHEA—PAINFUL MENSTRUATION.

There are said to be five varieties of this affection, which are termed respectively neuralgic, congestive, obstructive, membranous

and ovarian. Neuralgic dysmenorrhœa is caused by general neuralgia, chlorosis, gouty and rheumatic conditions of the system, high living, especially the use of stimulating condiments and excessive quantities of meat, sexual excess, and secret vice. Congestive dysmenorrhœa is caused by plethora, sudden chill, taking cold at the beginning of menstruation, chronic congestion of the uterus, retroflexion, cellulitis, torpidity of the liver, and constipation of the bowels. Obstructive dysmenorrhœa arises from obstruction of the canal of the uterus by anteflexion or other causes, as a fibrous tumor, polypus, or swelling of the mucous membrane from uterine catarrh. The variety known as membranous dysmenorrhœa, in which a cast or mold of the cavity of the uterus is sometimes expelled, is due to chronic congestion of the uterus, which is increased at the menstrual periods almost to a condition of inflammation. Ovarian dysmenorrhœa results from congestion and inflammation of the ovaries.

In neuralgic dysmenorrhœa, the patient has throbbing pain in the loins and lower part of the bowels, together with neuralgic pains in other parts of the body. In congestive dysmenorrhœa, when produced by taking cold, as by getting the feet wet just before the time of the menstrual period, the patient suffers with severe pain, often accompanied by a chill, which is followed by fever. When inflammation is present, the pain is dull and heavy. Severe bearing-down pains for a few hours or a day or two before the beginning of the flow, with relief either entirely or to a great extent as soon as the flow is established, indicates obstruction. In membranous dysmenorrhœa, the patient suffers with severe bearing-down pains, which cease as soon as the membrane is expelled. Ovarian dysmenorrhœa is characterized by pain continuing for several days before the period, in one or both groins, and extending down the thighs; there is also, usually, tenderness in one or both breasts. The tenderness in the groin is more or less marked between the menstrual periods.

Treatment.—Dysmenorrhœa can generally be cured by the adoption of proper means, provided the real cause is ascertained; though when due to fibrous tumors of the uterus, the treatment often fails. The most that can be done, however, in the domestic treatment of the difficulty, is to palliate the symptoms at the time of the menstrual period. Curative treatment can be best managed by a competent physician. The patient suffering with any form of dysmenorrhœa should take care to keep the bowels quite free by a carefully regulated diet, and the use of the warm water enema when necessary.

The patient should rest quietly in bed or upon the sofa for a day or two before the time for menstruation to begin. On the day it is expected, or as soon as the pain commences, the patient should take a hot full bath or a hot blanket pack, and should afterward be covered with warm woolen blankets, with hot water bags or heated bricks to the feet and back and over the lower part of the abdomen. The patient should be kept as quiet as possible. Severe pain, when not relieved by these measures, will often yield to hot fomentations when rapidly applied; or the application of the hot blanket pack. Especial pains should be taken to keep the feet and limbs thoroughly warm. The use of both faradic and galvanic electricity is in some of these cases very advantageous. We have often secured almost immediate relief from pain by their use. A large, hot enema will sometimes give relief. The water should be injected slowly, and should be retained for some time, half an hour at least if possible to do so. In some cases, hot sitz baths give speedy relief. Fomentations across the lower part of the back are also very advantageous. An application of heat to the lower spine, with cold over the ovaries, often gives marked relief.

Opium is frequently resorted to in these cases, but it should be avoided as much as possible, as the opium-habit is very likely to be contracted. The use of anodyne remedies in this disease is to be strongly condemned, as it also often induces the formation of the opium habit. In many cases we have found the pain to be due to small growths within the uterus, termed vegetations. Removal by a simple surgical operation often effects a speedy cure. Electricity applied by the method known as negative electrolysis, in judicious hands, has yielded satisfactory results. See also "Ovarian Congestion."

NYMPHOMANIA.

This term is applied to a condition in which there is an intense degree of sexual excitement. A female suffering with this affection will sometimes commit the grossest breaches of chastity. Its principal causes are self-abuse and a complete abandonment of the mind to lascivious thoughts. It is sometimes produced by ovarian irritation and by various diseases of the brain. The genitals are often found in a state of great excitement and abnormal enlargement in this affection.

Treatment.—Cool sitz baths; the cool enema; a spare diet; the application of blisters and other irritants to the sensitive parts of the

sexual organs, the removal of the clitoris and nymphæ, constitute the proper treatment.

The same measures of treatment are indicated in the cases in which the disposition to practice self-abuse is uncontrollable by other means. In an extreme case of this kind brought to us for treatment a few years ago, we were compelled to adopt the last-mentioned method of treatment before the patient could be cured.

STERILITY.

This condition differs from impotence in that the patient is not incapable of the sexual act, but remains childless.

Causes.—The most common causes are displacements of the uterus, contraction of the uterine canal, leucorrhœa, catarrh of the uterus, menorrhagia, sexual excess, secret vice, absence of the uterus or ovaries. Women who suffer from great losses of blood at the menstrual period, and those who are excessively fat are very apt to be childless, or if they become pregnant are likely to suffer miscarriage. In a much larger proportion of cases of sterility than is generally supposed, the difficulty exists in the husband instead of the wife. The causes of sterility in husbands have been considered elsewhere. It may be mentioned here that Dr. Nœggerrath, an eminent physician of New York City, after a very extensive investigation of the subject, asserts that what he terms "latent gonorrhœa" is a very common cause of sterility. Dr. N. holds that if a man has once suffered with gonorrhœa, even when months or years have elapsed after a cure has apparently taken place, he is still likely, in case he marries, to communicate to his wife a disease which will render her incapable of childbearing, if he is not himself rendered incapable of procreation as a just punishment for his sin and folly.

Treatment.—The various diseases upon which sterility may depend should receive first attention, and all the known causes should be avoided, particularly sexual excess. It may be properly mentioned in this connection that sexual contact just prior to or within a few days after menstruation is much more likely to be successful than at other times.

UTERINE CATARRH—ENDOMETRITIS.

SYMPTOMS.—GENERAL: *General debility; pulse weak; countenance pale and sallow; digestion slow; bowels very inactive; eyes dull, surrounded by a dark circle; nervousness; headache; hysteria.*

LOCAL: ***Weakness** in the back and lower part of the bowels; watery or glary discharge, sometimes very copious, often appears in adhesive, stringy masses; scanty or suppressed menstruation; painful menstruation; menorrhagia.*

The mucous membrane lining the cavity of the uterus is subject to catarrh as well as all other mucous membranes of the body. This condition is generally termed, inflammation of the interior of the womb, and it has long been treated as such. It has recently been thoroughly demonstrated, however, that this is not the case, and that the condition of the mucous membrane of the organ is that of congestion and not inflammation.

Causes.—The most common causes are improper dress; taking cold at the menstrual period; sexual excess; self-abuse; and whatever may cause congestion of the womb. It occurs very frequently in women who for any reason do not nurse their children after childbirth.

Treatment.—All exciting causes, so far as possible, should be removed. If the patient has been in the habit of wearing the clothing tight about the waist and suspended from the hips, and has neglected to clothe the lower extremities properly, these matters should receive immediate attention. The limbs should be thoroughly clad in flannel the greater portion of the year. The feet should be protected by thick woolen stockings and warm shoes. The clothing should be so loose as to remove all compression about the waist, and should be suspended from the shoulders by a waist or properly adjusted suspenders. The "Emancipator Waist," "Freedom Waist," and other articles of clothing introduced by the Dress Department of the Battle Creek (Mich.) Sanitarium, are to be highly recommended, and we are glad to see that these articles are meeting with general favor.

The diet of the patient should be nourishing but unstimulating. A large proportion of animal food is not advisable. Fruits and grains, with a moderate allowance of eggs and milk, constitute the best diet. Although excessive exercise, such as running, jumping, lifting, and horseback riding are injurious, a considerable amount of daily gentle exercise in the open air is very important. The sexual system should have entire rest during the course of treatment. In many cases, mar-

ried women suffering with uterine catarrh are barren. When pregnancy occurs, it is likely to be attended by a great number of complications, some of which are highly dangerous.

Careful attention should be given to the regulation of the bowels. A thorough movement should be secured daily, the enema being employed if necessary. In most cases, however, the inactivity of the bowels may be overcome by careful attention to diet, daily kneading of the bowels, and wearing the moist abdominal bandage at night. The local treatment of the disease consists in the employment of sitz baths and hot water douches. The sitz bath should be taken daily, or at least every other day, as follows: Begin the bath at 95°; after five minutes lower the temperature to 90°; after ten or fifteen minutes longer, the temperature should be lowered two or three degrees more and the bath immediately concluded. A warm foot bath should be taken at the same time, at a temperature four or five degrees higher than that of the sitz bath. In taking the hot douche, the patient should lie upon a bed or properly constructed table, with the hips slightly elevated. The glass or metal tube attached to the rubber tubing of the syringe should be passed up into the vagina behind the neck of the womb. From three to eight quarts of water should be employed at a temperature at least three or four degrees above that of the body. The best effect is obtained when the temperature of the water is increased to 110°; although good results may be obtained if the water is only 100° to 105°. If the patient finds disagreeable sensations are produced by a temperature which is not sufficiently high to produce the desired results, water of a lower temperature, as 95° to 100°, may be employed first, the temperature being gradually increased until the water is as hot as necessary. In occasional instances, disagreeable sensations will follow the first use of the hot douche, but this may be avoided by employing water of a moderate heat, and gradually increasing the temperature.

The best instrument for administering the douche is the syphon syringe. Fig. 210, p. 660. The Davidson, and various other forms of syringes may also be employed. The hot vaginal douche stands at the head of all remedies for uterine diseases of almost every description; but it is important that it should be administered thoroughly. It is impossible for a patient to take the treatment herself in such a way as to accomplish much good. It cannot be taken in an upright or sitting position, or in any other way than with the patient lying upon the back, with any prospect of good results. The employment of these measures

should be persisted in not only until the slightest symptoms of the local disease have passed away, but for several weeks after, and for a few days after each menstrual period, for several months. It is unnecessary to remark that the sitz bath or douche should be suspended during the menstrual period, unless the disease has assumed such a form as to occasion painful menstruation, when the hot sitz bath may be necessary to give relief. The injection of irritating lotions of various sorts into the cavity of the uterus, is, in our opinion, a hazardous procedure.

In chronic catarrh of the womb no remedy is of greater value than curettement. Vegetations are usually found present. In addition to curettement, electricity should be applied to the interior of the womb in the form of positive electrolysis, once or twice a week for several weeks. Applications of this sort must of course be made by a specialist or one who has given particular attention to electro-therapeutics.

Acute inflammation of the womb requires only rest in bed, hot douches, and the treatment above suggested; but in cases of so-called chronic inflammation (chronic congestion would be the better name), curetting and the application of electricity in the form of electrolysis are required.

CHRONIC INFLAMMATION OF THE WOMB—METRITIS.

SYMPTOMS.—GENERAL: *Similar to those of chronic catarrh of the womb, but much more intense; the patient has many feelings similar to those of early pregnancy.*

LOCAL: *Pain in the lower part of the back, extending around the body; weight, or dragging-down feeling in the bowels; pain just above the pubic bones, with tenderness on pressure; frequently, various symptoms relating to the bladder.*

This disease, like the preceding one, has long been mistaken for an inflammation, which its name really implies, but which does not in reality exist. The condition commonly known as chronic inflammation of the uterus is really congestion of the organ. In consequence of disturbance of the circulation in the womb it becomes engorged with blood and speedily becomes enlarged, sometimes reaching a size three or four times as large as in health. In consequence of the enlargement and increased weight, the organ settles down in the pelvis, and thus prolapsus, or falling of the womb, is produced. Sometimes its increased weight tips it over forward, producing another form of displacement, known as anteversion. In other cases it tips backward against the rectum, producing retroversion; by degrees the anteversion

or retroversion may become converted into an anteflexion or retroflexion, conditions in which the organ is bent upon itself. In some cases it is tipped to one side, conditions known as lateroversion, or flexion. The various symptoms arising from these several displacements are given in connection with their consideration elsewhere.

Causes.—The causes of inflammation of the womb are the same as those which have been mentioned. In cases of uterine catarrh, the whole organ finally becomes affected, as well as its mucous lining, by the long continuance of the causes referred to. Among the most active causes are sexual excess in married women, secret vice in the unmarried, the employment of various means to prevent conception, and improper dress. Very frequently, enlargement or congestion of the womb is the result of getting up too soon after confinement, in consequence of which the organ fails to return to its natural size, remaining more or less enlarged. Miscarriages and abortions are particularly liable to be followed by this condition, which is known as *subinvolution*. The wearing of badly fitting supporters should be mentioned as a not infrequent cause of chronic congestion of the womb.

Treatment.—The treatment for chronic congestion and enlargement of the uterus is essentially the same as that recommended for chronic uterine catarrh, the details of which need not be repeated here. The sitz bath, the hot douche, rest from violent exercise and from sexual excitement, and the avoidance of all the exciting causes of the affection, are the essentials of treatment. The method of treating this affection which was popular a dozen years ago, is now pronounced by the most eminent medical authorities to be in the highest degree irrational, and detrimental to the patient. The cauterizations to which thousands of women have been subjected, year after year, the only effect of which was to produce an aggravation of other ailments, are now condemned in no stinted terms by the very men who once employed these remedies.

In our experience during the last twenty years as Medical Superintendent of the "Medical and Surgical Sanitarium," we have met with hundreds of these cases, in which caustics had been employed at intervals for periods ranging from six months to twenty years; and we have to say that we have never met a case in which there was evidence of substantial benefit from the course of treatment employed. The effect of long-continued cauterization is to increase the very diffi-

culty which it is supposed to be efficient in curing. What the congested organ needs is not the application of irritating caustics, but the use of soothing remedies. The warm sitz bath attracts the blood to the surface, and thus relieves the local congestion. The hot douche acts efficiently as a remedy, by causing contraction of the dilated blood-vessels. Cold injections were formerly recommended for this purpose, but the benefit received by their employment was very slight, if any good at all was accomplished. Cold applications to the uterus cause immediate contraction of its blood-vessels, but the contraction produced is almost immediately followed by dilatation, so that the congestion may be aggravated rather than relieved. Hot applications cause first a slight increase of congestion, but this condition is subsequently followed by a contraction of the blood-vessels, which continues for a long time. This is well shown by a simple experiment. The hands dipped in cold water, or rubbed with ice, are at first blanched, but in a few seconds become red from congestion of the blood-vessels of the skin; while upon the other hand, if the hands are dipped in hot water, they become at first reddened, but after they have been immersed for a long time the skin becomes white through contraction of its small arteries. This is well shown in the white and wrinkled skin of the hands of a washerwoman, which have been immersed in warm water for several hours. In performing surgical operations upon the womb, when annoyed by troublesome bleeding, we have frequently resorted to the use of sponges dipped in hot water and applied directly to the organ, and have thus been able to witness an ocular demonstration of the utility of hot applications to this organ in the speedy checking of the bleeding, and the marked paleness of the organ after the application.

When there is considerable catarrhal discharge, some benefit may be derived from the employment of astringents. In addition to the hot water douche, alum, common salt, solutions of tannin, of golden seal, and various other astringent substances, are usefully employed. It is a very good plan to add a teaspoonful of powered alum, or common salt, to the last pint of water employed in the douche.

[Within the last few years great advances have been made in the application of aseptic and antiseptic principles to midwifery, or obstetrics. Full details of these improvements will be found in the Appendix.]

GRANULAR INFLAMMATION OF THE LIPS OF THE WOMB.

***SYMPTOMS.**—Profuse leucorrhœal discharge; general debility; aching around the lower part of the body, which is increased by walking or standing; symptoms of catarrh or congestion of the womb.*

This condition of the uterus is what is ordinarily treated as ulceration. It is not true ulceration, however; ulceration affects this organ very rarely indeed. The causes are catarrh of the uterus, chronic congestion, sexual excess, and prolapsus.

Treatment.—Sitz baths, hot douches, and the use of astringent lotions when the uterus is prolapsed. Benefit may sometimes be derived by passing up into the vagina, against the mouth of the womb, a little ball of cotton saturated with glycerine, or glycerine and tannin. A string should be tied about the middle of the cotton ball, so that it may be removed when necessary. It should not be kept in place more than a day or two at a time. In many cases, the granular condition of the lips of the womb is due to the occurrence of rupture at childbirth. When the tear is quite a serious one, a surgical operation is required.

STRICTURE OF THE UTERINE CANAL.

***SYMPTOMS.**—The patient suffers very painful menstruation and pain, beginning one or two days before the menstrual flow begins, being of a "bearing down" character.*

Stricture of the canal of the uterus is a cause of the most extreme pain in those who suffer with this difficulty. It may be a natural defect, which is not felt until the beginning of menstruation, or it may result from long-continued uterine catarrh, or from anteflexion, a condition in which the organ is bent upon itself.

Treatment.—This disease, when dependent upon anteflexion or uterine catarrh, is generally relieved by correction of these conditions. When it is congenital, however, in many cases the condition has required a surgical operation of some kind. When the oft-repeated suffering is long-continued, it may so wear upon the patient as to cause a complete breaking down of the nervous system; hence it is important that it should receive early and prompt attention; and if not speedily relieved, the services of a competent physician should be secured.

TUMORS OF THE WOMB.

The womb is subject to various morbid growths, the symptoms of which are very similar to those of chronic congestion. In many cases a person suffering with uterine tumors knows nothing of the real nature of the difficulty until after consultation with a competent physician. Among the numerous kinds of benign and malignant growths which are found in this organ, we will mention only polypus, fibroid tumors, and cancer. If the patient suffers continually with menorrhagia, leucorrhea, dysmenorrhea, and continual bearing-down pains, she should at once consult an intelligent physician, for the purpose of ascertaining the exact local condition.

The most common tumors of the uterus are fibroids. These are often very small, but sometimes attain quite considerable size. We have frequently found them present when the patient had no suspicion whatever of their existence ; and by means of a surgical operation for their removal, have relieved the patient of a great amount of suffering. The various forms of fibrous cystic, and fibro-cystic tumors which affect the uterus, afford the most experienced gynecologist ample scope for the exercise of his greatest skill.

Recent advances in this department of surgery render it possible to cure many cases of this kind which were formerly thought to be incurable. Malignant disease of the uterus is the most hopeless of all affections of this kind. When cancer in the womb is discovered at an early stage of development, a cure may often be effected by removal of the entire womb and ovaries. Dr. Emmett, an eminent New York specialist in the treatment of the diseases of women, many years ago called attention to the fact that cancer of the womb always occurs in women who have borne children and have suffered laceration of the neck of the womb. When the laceration is so great as to maintain a raw or eroded cervix, an operation is required.

DISPLACEMENTS OF THE WOMB.

The general symptoms of displacement of the womb, are often the same as those already described as characteristic of chronic congestion of the organ, which is one of the most common causes of displacement. The uterus may be displaced in three ways, known as *anteversion*, *retroversion*, and *prolapsus*. Lateral displacements also oc-

cur, but not very frequently. In most cases of uterine displacement the difficulty begins with the abdominal viscera, hence these must be held in position by means of the Natural Abdominal Supporter (see Appendix.)

ANTEVERSION.

In anteversion, the uterus, while maintaining its straight form, is tipped forward against the bladder. The organ is tipped slightly forward in its natural condition, so that anteversion is simply an exaggeration of its natural state. The particular symptoms which arise from this form of displacement are painful and frequent urination, aching pain just above the pubic bones, in some cases pain in moving the bowels, and inability to walk or to be upon the feet on account of the aggravation of the local pain. The principal causes of anteversion are enlargement of the womb, violent efforts, as in lifting, jumping, straining, and especially tight-lacing; the last-named cause is undoubtedly the most common of all. Anteversion may also be the result of the weakening of the ligaments which sustain the uterus in position.

Treatment.—The first matter to be attended to, is removal of the cause. This will require attention to the suggestions made for the same purpose with reference to chronic congestion of the uterus. A surgical operation is sometimes necessary in order to effect a radical cure. Anteversion, like anteflexion, seldom requires treatment.

RETROVERSION.

This condition is that in which the uterus is tipped backward against the rectum. The organ may be tipped directly back, or inclined more or less to either side. The principal symptoms are constant pain in the lower part of the back; great discomfort in walking; increased pain on moving the bowels, with a sense of obstruction; sometimes spasmodic contraction of the rectum or bladder; painful menstruation, in some cases chronic inflammation of the bladder.

Treatment.—The same remark made with reference to cause and treatment in connection with the subject of anteversion, applies also to retroversion. Frequent sitz baths and daily hot douches are among the essentials of treatment. To these should be added daily replacing the organ by a competent person. When the organ is not bound by ad-

hesions, replacement may generally be effected by the patient herself by the following procedure: The patient should place herself upon the bed in a kneeling position. She should now bend forward until the chest is in contact with the bed. The limbs should now be moved downward until the thighs are perpendicular, so that the pelvis is elevated in the air as high as possible. The inlet of the vagina should then be opened so as to admit air. This may be done by raising the perinæum with the finger. As soon as the air enters, the womb falls forward into position. When necessary, air may be admitted by means of a glass tube inserted before the exercise is begun, or by means of the **Davidson** syringe.

Operation for Shortening the Round Ligaments.—The advances of scientific surgery within the last few years make it possible now to effect a radical cure in this affection by shortening the round ligaments. The operation by means of which this is accomplished is a safe and successful one. In nearly four hundred and fifty cases operated upon by the writer, all have recovered from the operation without dangerous symptoms, and in very few instances did the operation fail to effect a radical cure.

PROLAPSUS OF THE WOMB.

SYMPTOMS.—Dragging pain in the lower part of the back, extending around the body; general tenderness over the pubes; sensation of fullness in the vagina; irritation of the bladder and rectum; discomfort increased by walking or exertion; leucorrhœa; painful or profuse menstruation; in very bad cases, protrusion of the organ; symptoms sometimes absent.

Every cause which tends to produce disease of the sexual organs in females may occasion prolapsus. The immediate cause in chronic cases, and that which presents the greatest obstacle to successful treatment, is relaxation of the natural supports of the organ.

Treatment.—The usual treatment for prolapsus consists almost exclusively in the application of supporters of various kinds. The amount of ingenuity which has been displayed in the construction of devices of various sorts for the purpose of restoring a prolapsed uterus to its natural condition is not surpassed by the display of inventive genius in any other direction. While pessaries or supporters of some kind are often very useful in the treatment of prolapsus as temporary palliatives, and as a means of relieving cases which are incurable, they should ever be regarded as incapable of producing a radical cure. In many cases they actually increase the morbid conditions upon which the prolapsus depends, although giving temporary relief to the most unpleasant symptoms attending this form of displacement.

A rational plan of treatment for prolapsus requires, first, the removal of the causes by which the difficulty has been produced, when they are still in operation; second, relief of the congestion and enlargement of the organ by proper treatment; third, palliation of the painful symptoms attending this condition; fourth, restoration of the natural supports of the organ to a healthy condition.

The first indication must be met by thorough and careful attention to the laws of sexual hygiene. The second indication is best met by a persistent use of sitz baths and the vaginal douche, which should be taken as recommended for the treatment of catarrh and congestion of the womb. In many cases, the douche can be taken twice a day with advantage, in the morning and again just before retiring at night. Greater benefit is derived from this treatment when the patient can remain in a recumbent position for some hours afterward.

In some cases the patient requires rest from walking and other exercises upon the feet. In the majority of cases, however, it is better for the patient to continue as much exercise as can be endured without excessive fatigue, as it is important that the muscular strength should be kept up. The third indication is in part met by the treatment already described. The hot douche and sitz baths will generally accomplish more than any other two remedies in relieving the local pain and discomfort. In many cases, much additional benefit may be derived from wearing a properly adapted pessary or supporter. When the womb is prolapsed, its circulation is interfered with so that the organ becomes engorged with blood. This can be overcome by a restoration of the organ to its proper position so as to give freedom to the circulation. The simplest form of supporter is a small roll of cotton. It should be pressed up against the mouth of the womb after it has been restored to its proper position. It should be introduced while the patient is lying upon the back. The ball of cotton should be large enough to be retained in position, and should be saturated with glycerine or a weak solution of tannin in glycerine before being applied. A string should be tied around the center of the roll to facilitate its removal. This application the patient can make for herself, though not nearly so well as it can be made by a physician. Care should be taken in removing the cotton that the organ is not dragged down with it. It should be first loosened by the finger to facilitate its removal. Cases which need the application of the pessary require the care and attention of an intelligent physician.

The fourth indication is the most important of all, as it relates more directly to the radical cure of this affection. Unfortunately, this part of the treatment of prolapsus is rarely attended to. Either the physician fails to appreciate the importance of this part of the work, or the patient is satisfied with a mere amelioration of her symptoms, and fails to persevere in carrying out the proper methods of treatment until a complete cure is effected. In meeting this indication, one of the best of all measures of treatment is the daily employment of special exercises. General exercise is essential for the purpose of strengthening the general muscles of the body ; but there are certain special exercises which may be taken, the advantage of which can hardly be overestimated.

We will describe two or three of the more simple forms of special exercise. Let the patient place herself upon a smooth and moderately hard surface. A soft, springy bed is not suitable for the purpose. A hard sofa will answer very well. The feet should be drawn up as close to the body as possible. Let the patient now lift the lower part of the body so that the hips and lower portion of the trunk will not touch the surface, the body being wholly supported by the feet and shoulders. The body should be held steadily in this position for a minute or two, or as long as possible without any considerable fatigue to the muscles, when the body should be lowered to its original position. After a few minutes' rest, the same exercise should be repeated. This exercise may be continued twenty or thirty minutes, according to the patient's strength. By elevation of the hips in the manner described, the contents of the lower portion of the abdomen will, by the force of gravitation, be drawn from their abnormal position into their original place. Prompt relief very often follows the employment of this measure, even the very first time it is applied ; and if it is continued daily, and two or three times a day when the patient is sufficiently strong, very excellent results may be looked for.

Another movement which is very effective for the same purpose, consists in supporting the body upon the toes and elbows with the face downward, the hips being raised as much as possible. Still more thorough exercises may be taken by the aid of an assistant. One of the best of this sort consists in elevation of the lower extremities by means of an assistant, while the patient lies upon the face, supporting the body by the chest and keeping the limbs rigid while the feet are elevated by the assistant. While the hips are elevated in movements of this sort, the intestines fall forward in the abdominal cavity, dragging the prolapsed womb after

them. Movements of this sort not only strengthen the abdominal muscles by calling them into active exercise, which of itself has a tendency to lift the prolapsed organs into position, but the force of gravitation acts directly to restore the displaced organ to its normal position. The patient will also derive great advantage from sleeping with the hips elevated as much as is consistent with comfort. In addition to these measures, the patient may take with advantage certain exercises for developing the muscles of the trunk and abdomen, such as bending forward and backward, bending sideways, kneading and percussing the abdominal walls, lifting weights with hands stretched above the head while lying down, etc.

Electricity is an admirable remedy for use in these cases. It may be applied both externally and internally. When applied internally, it should be in the hands of a competent physician, unless administered in connection with the hot douche. The movements may be taken several times a day. If taken but once, the best time is at night just before retiring. This is also the best time for taking an astringent douche. A very excellent plan is to take the movements first, then the hot douche, concluding by the injection of a pint of water containing one quarter of an ounce of alum or tannin, or two tablespoonfuls of a strong decoction of oak bark. By means of the movements the uterus is restored to its natural position, and by the aid of the hot and astringent injections, the lower supports of the uterus are toned up so as to aid in holding the organ in position.

Congestion is also relieved by the same treatment; and this gives nature the opportunity during the night to do much toward restoring the organ to its normal condition. When the patient suffers much with constipation, which is always present in these cases, and very obstinate, the bowels should if possible be relieved at night just before retiring. In case there is loss of desire to move the bowels, which sometimes exists, benefit will be derived from the injection into the rectum of four tablespoonfuls of cold water containing five or six drops of tincture of camphor. The solution should be retained ten minutes, by the end of which time there is generally a very strong desire to move the bowels.

In cases in which the prolapsus is due to rupture of the perinæum in childbirth, a surgical operation may be required to effect a cure. We have met many cases of this kind, and by performing the necessary operation to restore the parts to a natural condition, have

obtained the most gratifying results. A slight operation is sometimes needed where there has been no laceration.

FLEXIONS.

From various causes, the womb may become folded upon itself. When this occurs anteriorly, it is termed anteflexion. When the organ is folded backward against the rectum, the condition is termed retroflexion. Lateroflexion is a condition in which the organ is folded over to one side. Anteflexions and retroflexions usually result from ante- and retroversions. The principal symptoms of anteflexion are an irritable condition of the bladder, with a frequent desire to urinate; a severe pain at the beginning of menstruation, which is usually relieved suddenly and completely at the beginning of the menstrual flow. The pain sometimes lasts a day or two at the beginning of each period, the patient often being at other times quite free from any inconvenience. The symptoms of retroflection are essentially the same as those of retroversion, except that they are all exaggerated. Pain in the back and obstinate constipation are the leading symptoms. The patient is also likely to suffer with profuse and painful menstruation.

Treatment.— The same general plan of treatment recommended for prolapsus should be followed for flexions and all other displacements of the womb. In case of anteflexions, the first form of special exercises recommended for prolapsus should be taken daily. In the majority of cases of retroversion, a radical and permanent cure can be established only by an operation for shortening the round ligaments which naturally hold the uterus forward, but become greatly elongated when the uterus remains for a long time in a state of retroversion or flexion. In performing this operation, the writer has frequently found it necessary to shorten the ligaments fully six inches. The operation is devoid of danger in skilled hands, and in over five hundred cases operated upon by the writer, failure to obtain complete success has occurred in only a very few instances, and in these cases the failure was not the fault of the operation.

LEUCORRHEA—WHITES.

This is a symptom of disease rather than an independent malady. It is indicative of quite a variety of conditions. The discharge to which the term "whites," or "female weakness," is familiarly applied, varies

considerably in character. A natural discharge of whitish mucus, the proper secretion of the vaginal mucous membrane, takes place for a short time just before and just after menstruation, and need occasion no concern; but when the discharge becomes continuous, not disappearing in the interval between the menstrual periods, it becomes a symptom of disease. A very profuse discharge naturally takes place also in the latter part of pregnancy.

The indication of this symptom depends largely upon the character of the discharge. Viscid mucous discharges are generally from the womb. Curdy mucous discharges are occasioned by catarrh of the vagina. Clear or turbid watery discharges, especially when very offensive in character, are indicative of tumors or malignant disease of the womb. Discharges containing pus are indicative of inflammation or ulceration; they may proceed from the vaginal mucous membrane or from the uterus. Reddish or bloody discharges accompany tumors of various kinds, cancer, and ulceration of the womb; discharges of a very offensive character, especially when occasionally mixed with blood, are indicative of the presence of malignant disease. Offensive discharges are not positive evidence of the presence of cancer, however, as they may arise from other causes.

In an addition to the special causes mentioned, leucorrhœa may result from simple congestion of the blood-vessels of the vaginal mucous membrane due to improper dress. It may also be occasioned by taking cold, by sexual excess, and by a debilitated condition of the system.

Treatment.—Hot douches and sitz baths are as effective for this as for other morbid conditions of the female sexual organs. The hot water injection should be made slightly astringent in character by the addition of powdered alum, tannin, and other mild astringents. Alum may be used in the proportion of a teaspoonful to a quart of water. Tannin may be used in proportion of one dram to the same quantity of water. When the discharge is offensive, a solution of permanganate of potash in the proportion of ten grains to a pint of water, or carbolic acid in proportion of fifteen drops to a pint of water, will generally be effective in correcting the fetor.

INFLAMMATION OF THE VAGINA—VAGINITIS.

***SYMPTOMS.**—Hot and burning pain in the vagina; aching pain in the perinæum; frequent urination; profuse and purulent leucorrhœa; soreness of the external parts.*

This affection very closely resembles gonorrhœa, from which it is sometimes difficult to distinguish it. In a somewhat rare variety of the disease the whole vaginal mucous membrane is covered with granulations, which renders it exceedingly sensitive. The causes of vaginitis are cold, irritating discharges from the womb, caustics, badly fitting supporters, self-abuse, and excessive coitus.

Treatment.—An acute attack of vaginitis can generally be cured in ten days or two weeks by the employment of sitz baths, warm douches, injections of starch water, and resting in bed. Other measures are seldom necessary. When the disease is chronic, longer time is required for a cure. Glycerine and tannin, in the proportion of one-half dram of the latter to one ounce of the former, is an excellent remedy in chronic vaginitis, to be applied to the affected part daily or every other day by means of cotton saturated with the solution. A solution of chlorate of potash, a dram to a half pint of water, is also a very useful remedy. Dr. Smith, of London, especially recommends a solution of half an ounce of alum and a dram of tannin to a quart of water, one-half to be used at night and the other half in the morning.

Gonorrhœa in females is to be treated upon essentially the same plan.

VAGINISMUS.

SYMPTOMS.—Pain on walking ; severe spasmodic pain on touching the affected part.

This is often a very severe affection, being the occasion not only of great inconvenience, but of intense mental as well as physical suffering. It consists in an unnaturally sensitive condition of the vagina which causes violent spasmodic contraction of its walls from the slightest irritation. The chief causes are hysteria, inflammation of the vagina, excoriations of the mucous membrane, vascular tumors of the urethra, and fissure of the anus.

Treatment.—This affection is sometimes exceedingly obstinate, requiring a surgical operation for relief. The patient should consult a competent physician without delay.

CYSTOCELE.

This is a condition in which the anterior wall of the vagina, together with the bladder, falls downward in such a way as to produce a bulging. In some cases the parts protrude. The most common cause of this condition is rupture of the perinæum in childbirth. In consequence of the

falling down of the lower portion, the bladder is never entirely emptied of urine, and as a result, decomposition of the retained urine takes place, which gives rise to catarrh of the bladder, pain, heat, painful contractions, and difficulty in urination. The appearance of these symptoms after an unusually hard childbirth, from which the parts have been exceedingly sore and long in healing, may well give rise to apprehension of this condition, and a good surgeon should be consulted. We have frequently met with cases of this kind, which had been treated for disease of the bladder for many years without the real cause of the trouble being discovered, to whom we have been happy to bring relief by the performance of a surgical operation, by means of which the parts were restored to their natural condition.

RECTOCELE.

This is a condition similar to the preceding, occurring in the posterior wall of the vagina. On account of rupture of the perinæum, the natural supports of the uterus are removed, and this organ settles down, causing a bulging forward of the lower portion of the vagina, and with it the anterior wall of the rectum to which it is attached. This pouch-like extension of the rectum gets filled with the contents of the bowels, producing much pain, tenesmus, local irritation, and mucous discharges from the bowels. Rectocele, like the preceding condition, can only be cured by a surgical operation, a proceeding which we have often found necessary in patients who have suffered for many years without being aware of the nature of the difficulty.

ITCHING OF THE GENITALS—PRURITUS.

This is a most annoying affection which sometimes renders the life of a person suffering from it almost intolerable. It may be caused by irritating discharges from the uterus or vagina, or it may be due to an extension of a disease of the skin to these parts. It is quite likely to occur in women suffering from diabetes. It is also one of the miseries attending upon cancer of the uterus, arising from the irritation caused by the acrid discharges characteristic of this disease. Thread-worms are also said to be a cause of this affection. It occurs most frequently at the time of the menopause, or "change of life."

Treatment.—When caused by an acrid discharge, keep the parts thoroughly cleansed by frequent vaginal injections. The intolerable itching will generally be relieved by the use of one of the following solu-

tions: Sulpho-carbolate of zinc two drams, dissolved in eight tablespoonfuls of water, to be applied to the affected parts twice a day, and allowed to dry upon the surface; carbolic acid, ten to twenty drops, glycerine and water each a tablespoonful; powdered borax or sulphite of soda a teaspoonful, dissolved in a pint of water. When there is much irritation of the parts, some soothing ointment should be applied, as vaseline. Hot injections are also recommended.

IMPERFORATE HYMEN.

This is a condition in which the vaginal orifice is closed by an excessive development of the hymen. When complete, it causes a retention of the menses. Although the patient has all the other symptoms of menstruation, the menstrual flow does not appear. Though not sufficient to occasion an obstruction to menstruation, it may be sufficient to render the sexual act impossible. The difficulty is not usually discovered until after marriage, and may give rise to a great amount of unnecessary distress. As the difficulty can be very easily remedied by a competent physician, such an one should be at once consulted on the discovery of grounds for suspicion of the existence of this congenital deformity.

INFLAMMATION OF THE BREAST—MASTITIS.

SYMPTOMS.—Deep, throbbing, burning pain; restlessness; fever; hard and tender swelling of the breast.

The most frequent cause of inflammation of the breast is taking cold while nursing. Inflammation may also be excited by a blow upon the breast; it sometimes occurs without apparent cause.

Treatment.—On the appearance of the first symptoms, hot fomentations should be vigorously and continuously applied for some hours. In many cases, the disease can be arrested when promptly treated in this way. Alternate hot and cold applications may be tried when fomentations do not accomplish the desired result. When the breast is swollen very large, it should be supported by means of adhesive straps carefully applied. If an abscess forms, it should be opened promptly and should afterward be treated by antiseptic dressings (see Appendix).

GALACTORRHŒA.

This is a peculiar condition of the breast in which a continuous flow of milk occurs either between the intervals of nursing or after the infant has been weaned. It is chiefly due to a relaxed condition of the

nipple, abnormal activity of the gland, or to debility. It is often a very intractable affection, but can generally be relieved by astringent applications to the nipple, as of glycerine and tannin in proportion of a dram of tannin to an ounce of glycerine, or a decoction of oak bark; gentle friction of the nipple; drawing out of the nipple by means of the breast pump; or application to the breast of a solution of belladonna in glycerine, in proportion of a dram of the extract to an ounce of glycerine. Cold applications to the breast are also in many cases very effective. Ice compresses may be employed, or, better, rubber bags containing iced water or pounded ice.

OVERGROWTH OF THE BREAST.

This condition may be due to an over-accumulation of fat or to an actual overgrowth of the gland itself. The causes of the first condition are obesity, and masturbation and other sexual excesses. Overgrowth of the gland itself is due to the organ not diminishing in size after lactation. In the first form, the breast is large and soft. In the second, it contains nodular masses which are portions of the enlarged gland. Proper treatment of the first form consists in removal of the causes; hot and cold applications in the second form of the affection.

ATROPHY OF THE BREAST.

This is a much more frequent condition than the preceding. The breast is flat and the nipple small. This condition is sometimes due to deficient development of the ovaries, in which cases it is accompanied by amenorrhœa. The more frequent cause is compression of the breast by means of stays, corsets, or artificial forms. This difficulty is very obstinate, frequently yielding to no method of treatment that can be employed.

CRACKED NIPPLE.

This affection frequently occasions a great amount of inconvenience to a nursing mother. Slight fissures which at first appear on the nipple develop into serious excoriations which may become so extensive as to destroy the nipple. The chief causes are too frequent suckling, and failure to carefully dry the parts. The best treatment is prevention. The nipple should be hardened by bathing in cool water daily for some time before its use is required. Equal parts of alcohol and water with

glycerine, a weak solution of tannin, or a decoction of oak bark, and similar lotions, are excellent means of hardening the skin, and thus preventing the occurrence of fissures. Thorough cleansing of the breast is a matter of great importance. Bad excoriations should be treated with a solution of ten or fifteen drops of carbolic acid in an ounce of glycerine, the fissures being treated two or three times a day after being cleansed. When all remedies are ineffective, it is sometimes necessary to suspend nursing.

CANCER OF THE BREAST.

SYMPTOMS.*— *Throbbing, darting pains, and a sense of weight in the breast; sometimes little or no pain; a hard swelling in the substance of the breast which is first movable, afterward becoming fixed; nipple drawn in; tenderness to the touch; skin over tumor reddish, afterward becoming purple; in some cases the whole breast is moderately hard, there being no distinct tumor.

Treatment.— The intractable nature of malignant disease in any part of the body, when well developed, makes it important that prompt measures should be taken upon the first discovery of any symptom affording ground for suspicion of cancer of the breast. The patient should not hesitate and temporize until the chances for a permanent cure are lost. The opinion of the best pathologists at the present day is that the disease is wholly a local affection in its early stages, so that if the diseased part is removed before other parts of the body become infected, the patient has a chance to recover. There is only one method of treatment for use and recommendation in these cases, and that is, thorough removal of the diseased part as soon as suspicious symptoms occur. The earlier the removal can be effected, the better. Of the various methods which have been employed, the removal by the knife is in the majority of cases the best, as it is a thorough operation, and it can be made painless by means of anesthesia; it also possesses the advantage of giving the parts an opportunity for healing immediately, thus affording less opportunity for the disease to return. We have removed a number of cancers by this method, and have thus far heard of no recurrence of the disease. No remedy is a positive cure however, since the same depraved condition of the system which gave rise to the disease in the first place may cause a new outbreak, even though the first be entirely cured.

The public cannot be too frequently and earnestly warned against patronizing the numerous horde of cancer doctors who thrive upon the

ignorance of the masses, lauding the virtues and advantages of so-called specifics which are warranted to cure every case. These wonderful (?) specifics, when of any value whatever, are standard remedies which are well known to the regular profession and have been for years. The apparent success which many of these quacks achieve is due to the fact that they do not hesitate to pronounce all forms of tumors to be cancers, notwithstanding the fact that the great majority of tumors are wholly benign. A person finding a small painful lump in the breast should consult a skillful surgeon at once, especially if there is any history of malignant disease in the family. In cases of cancer of the breast which are already very far advanced, ulceration having begun and infection of the system having taken place, as shown by the debilitated condition of the patient and enlargement of the glands under the arm, etc., removal of the breast may still be of advantage in prolonging the life of the patient and adding to her comfort, although there may be no hope of effecting a cure. The application of ice to the affected part in the form of iced compresses, or better, by means of rubber bags filled with iced water or small pieces of ice, is an excellent means for relieving the severe pain which characterizes the disease, and also for delaying its progress. Frequent freezing of the diseased parts by means of a mixture of salt and pounded ice, in proportion of one part of the former to two of the latter, applied by means of a muslin bag, has been very highly recommended for holding in check the progress of this terrible malady.

FIBROUS TUMOR OF THE BREAST.

Hard, painless lumps, of the size of a filbert, are often found in the breast, sometimes several being present in the same individual. These are simply fibrous tumors, and need not give rise to any apprehension, as they rarely, if ever, become larger than the size mentioned, and usually disappear of themselves, especially if the breast is frequently called into functional activity by nursing. As these growths give rise to cancer in some cases, they should be removed.

IRRITABLE BREAST.

The breast is sometimes the seat of severe neuralgic pain. In other cases, the pain is located in the intercostal nerves, just beneath the breast, particularly upon the left side. We have occasionally met cases in which the whole breast was very sensitive, the patient shrink-

ing from the lightest touch. These difficulties arise from a great variety of causes, chief among which may be mentioned hysteria and spinal irritation. The most severe case of irritable breast we ever met, was in the person of a young woman who was grossly addicted to the habit of self-abuse. The left breast in this case was considerably swollen, pulsated violently, and was apparently so sensitive as to cause the patient to scream with pain, even at the slightest touch. The discontinuance of the habit caused an entire disappearance of the morbid irritability within a week, so that the patient was able to strike the breast a full blow without suffering any inconvenience whatever.

RUPTURE OF THE NECK OF THE WOMB.

This accident is the result of childbirth, in consequence of unnatural rigidity, excessive size of the head of the infant, malposition, the use of instruments, precipitate labor, and perhaps from other causes. A tear may occur either in the neck of the womb, or in the perinæum. In case the laceration occurs in the neck of the womb, the patient may be wholly unaware of the accident at the time, and perhaps may never become conscious of it, but will suffer the consequence nevertheless. If the difficulty is not discovered and remedied, the usual result is, that, instead of making a rapid recovery after childbirth, the patient remains weak for a long time, and is perhaps confined to bed on account of the pain and inconvenience occasioned when she attempts to get upon her feet and walk about. She suffers with all the symptoms of congestion of the womb, and after a time suffers with prolapsus, or some form of displacement. Menstruation is likely to be very profuse. This condition often goes undiscovered, even when the patient resorts to a physician for examination and advice. The majority of cases of laceration of the cervix, or neck of the womb, are treated for ulceration. When the physician makes an examination, he finds the lips of the womb enlarged, gaping, rolling outward, congested, and often covered with granulations. Too often these symptoms are mistaken for inflammation or ulceration of the womb, and the case is accordingly treated with caustics and various other routine remedies. In consequence of the laceration, dense cicatricial tissue forms upon the raw surfaces, which increases with the lapse of time, especially if the patient is subjected to a course of cauterization. We have met many of these cases in which laceration had existed for periods varying from five to fifteen years, the patients

having been invalids during all of this time; and in scarcely a single instance had the real nature of the difficulty been previously discovered. They had been treated for "prolapsus," "inflammation," "ulceration," "elongation of the neck," various displacements, and, in fact, almost everything but the real difficulty.

Treatment.—The proper remedy for this accident is the restoration of the torn parts to their natural condition as nearly as possible. In order to accomplish this, it is necessary to carefully remove all of the products of inflammation and long-continued irritation. The dense, cartilage-like substance which is nearly always present, and which produces a great amount of reflex irritability, such as severe headache, pain in the spine, obstinate dyspepsia, etc., must first be carefully removed; then the parts are brought together and secured, by means of a fine silver wire. In the course of nine or ten days, nature cements the torn parts together again, and the organ is restored to its normal condition. This operation is one devoid of danger when performed by a skillful surgeon with the aseptic precautions which modern surgery has taught us to employ, and often affords relief from a long train of most distressing symptoms. In many cases, erosion, or what is commonly termed ulceration of the neck of the womb, will exist so long as the tear is not repaired. The diseased condition thus located at the mouth of the womb, gradually extends up into the interior, producing catarrh of the womb, profuse menstrual flow, painful menstruation, enlargement of the womb, prolapsus, retroversion, and certainly must be disposed to the formation of fibroid tumors of the womb. Another important fact pointed out by the eminent Dr. Emmet, of New York, ought not to be forgotten; namely, that cancer of the womb rarely occurs except in women who have suffered from laceration of the neck of the womb. In the many cases of cancer of the womb which have come under the writer's care, there has been but one case in which a clear history of laceration of the womb prior to the appearance of cancer could not be obtained; hence the importance of attending to this condition promptly. Recent observations seem to show that it is possible to repair the neck of the womb as well as the perineum immediately after the occurrence of the laceration in connection with childbirth, or within a few hours. The operation must, of course, be done by an experienced surgeon.

LACERATION OF THE PERINÆUM.

Judging from the large number of cases of this sort which have come to our notice, laceration of the perinæum is an accident which probably occurs fully as frequently as the form of laceration just described. A slight degree of laceration almost always occurs at the birth of the first child. When this is very slight, no harm results; but when it extends into the muscular tissue, serious injury is done. The laceration may be so extensive as to bring the two passages together in one. A complete laceration of this sort is usually discovered at the time of its occurrence; but when it is smaller in extent, the rupture is most frequently overlooked. The symptoms of rupture of the perinæum are an unusual amount of soreness and long delay in healing. When the patient attempts to get upon her feet, she soon begins to suffer from the various symptoms of prolapsus, or retroversion. She is unable to walk but a short distance, suffers with pain in the back, weakness, and various other local disturbances. If the rupture is complete, there will be a loss of power to retain the contents of the bowels, especially when the bowels are loose.

Treatment.—The proper treatment for this accident, as well as the preceding, is a surgical operation, whenever the laceration is more than very slight. When the laceration is discovered, the operation should be performed within five or six hours of its occurrence. If not attended to then, it should be at a subsequent period, when the patient has so far as possible recovered her usual strength. The operation consists in making raw the surfaces which have been drawn apart, bringing them together with sutures. This operation requires not a little mechanical ingenuity, but affords a degree of relief which in some cases seems almost marvelous. The operation is not a dangerous one when performed with proper precautions and by one expert in operations of this sort. It may be executed in a few minutes and with almost absolute certainty of securing complete relief from the distressing symptoms to which this injury gives rise. Very slight lacerations usually require no attention. Sometimes, however, laceration of the structures beneath the surface occurs, without external injury of the tissues, making the operation necessary.

Judging from the large number of these cases which have come under our observation in the treatment of several hundred cases of disease peculiar to women, at the Medical and Surgical Sanitarium,

we have no doubt that there are at the present time thousands of women who have been suffering for many years from the effects of laceration of this sort, which might readily be cured by a proper surgical operation. We have dwelt at some length upon this class of cases for the purpose of calling special attention to them. On account of the general neglect with which they are treated, we urge upon every lady who has borne children and who has any reason to suspect that any difficulty of this sort may exist, the importance of consulting a surgeon at the earliest possible moment, selecting the most competent and reliable surgeon who has had experience in such cases, who may be accessible.

Change of Life.—The change of life, or *menopause*, the cessation of the function of menstruation, usually occurs between the ages of forty and fifty. It sometimes occurs a little later, and sometimes as early as between thirty and forty. We have met one case in which it occurred before the age of thirty. The usual symptoms are irregularities in the times and quantity of the menstrual flow, various nervous symptoms, sudden flushing of the head and other parts of the body, congestion of the head, and disorders of the digestion, etc. During this critical period of her life a woman should have abundance of rest, freedom from care, frequent recreation, plenty of out-door exercise of a gentle character, and mental diversion. Special attention should be given to the general health, and all the laws of hygiene should be regarded carefully.

Coccygodynia — Painful Sitting. — This is an occasional accompaniment of pregnancy, though it often occurs in other conditions as well, and is not confined exclusively to the female sex. The disease consists of a painful affection of the coccyx, or terminal portion of the spinal column. The proper treatment consists in applications of cold, alternate heat and cold, galvanism, and in bad cases, the performance of a surgical operation.

Enlarged Abdomen.—In women who have borne several children in rapid succession, the abdominal walls often become flaccid and pendulous. The only remedies for this condition are cool bathing, the application of electricity, the employment of an abdominal bandage, massage, and carefully graduated gymnastics.

OBSTETRICS, OR MIDWIFERY.

We shall not attempt to enter into the technicalities of this subject, as this is forbidden both by the object of this work and the space which can be properly devoted to it. We wish especially to emphasize, however, the fact that the art of midwifery is one which is worthy of the very highest skill and ability that can be brought to it. The once popular notion that it is something that should be left to nurses and old women is in the highest degree pernicious. While childbirth is a function which when naturally performed is attended by little risk to either mother or child, and requires but a very moderate amount of skill or knowledge to meet all the necessary requirements, it should be borne in mind that various accidents, irregularities, unnatural conditions, and sundry other deviations from the natural course of events, are likely to occur at any time, and without previous warning, being often of so serious a nature as to threaten the life of both mother and child. To meet some of these emergencies, the very highest skill and the fullest knowledge are often required. Hence this essential art should not be left in the hands of the ignorant; and it is important that the public should be sufficiently informed upon the subject to at least appreciate the necessity for, and the full value of, skill and experience in this department of medical science.

In cases in which the pain begins and ends with the menstrual flow, relief may generally be obtained by dilatation of the neck of the womb, an operation which is devoid of danger when performed under the aseptic conditions which are now so thoroughly understood.

SIGNS OF PREGNANCY.

The first indication of pregnancy likely to attract attention is the cessation of menstruation. When this occurs, without other sufficient cause, as taking cold at the menstrual period, or as the result of disease, there are good grounds for suspecting that conception has taken place and the period of gestation or pregnancy begun. It should be remarked, however, that pregnancy may occur without the menstrual function ever having made its appearance. It should also be remarked that a periodical flow resembling menstruation, though probably really

different in character, is occasionally present during the whole period of pregnancy.

A very early symptom is morning sickness, which may occur the first week after conception, and frequently continues for six or eight weeks. Some do not suffer at all from this symptom. Others suffer with extreme severity. Cases occasionally occur in which the vomiting continues without interruption in spite of all remedies which can be employed, sometimes wearing out the life of the patient before the pregnancy is completed. The vomiting at this period is considered to be sympathetic.

At the end of six or eight weeks the breasts begin to enlarge, the nipple becomes more prominent, and the dark ring about it becomes much more distinct, especially in persons of dark complexion. The little protuberances about the nipple also become much more prominent. In some cases, dark spots appear upon the face, hands, and other parts of the body. At this time, the womb, having become abnormally heavy on account of its increasing size, settles down in the pelvis, causing the abdomen to appear flat.

Between the third and the fourth month the fetus becomes developed to such an extent that its heart-beats may be distinguished by placing the ear to the abdominal walls. It is recognized by its very rapid character and the fact that it does not agree with the pulse of the mother. The pulse will generally be found to be 120 to 140 per minute. In male infants the heart-beat is less frequent than in females.

Quickening.—Motions of the child, popularly known as quickening, are generally felt at about four or four and a half months. The supposition that at this time the fetus acquires individual life is a popular error. The fetus makes movements of various sorts long before this period; but they are not usually strong enough to be felt by the mother, and hence are not noticed. The motions are sometimes so strong as to be exceedingly disagreeable, especially to patients of a nervous temperament. They can generally be readily felt by placing the hand upon the abdominal wall. If they do not happen to occur in a short time, they may be excited by dipping the hand into cold water and laying it upon the abdomen.

This is one of the best signs of pregnancy, and yet it is not an invariable indication, as women often imagine that they have felt motions, when none at all have been experienced, or nothing more than the move-

ments of the intestines from indigestion and moving of gas in the bowels. On the whole, however, this may be considered as a very good indication of pregnancy.

At the end of four months the enlargement can be easily distinguished through the abdominal walls. As the uterus increases in size, it rises out of the pelvis, and often inclines toward the right side.

In the latest stages of pregnancy, vomiting again returns in consequence of the pressure upon the stomach. Toward the conclusion, there is profuse leucorrhœa, and at the very last the uterus settles down into the pelvis again as much as possible.

During this process the uterus increases to more than twenty times its normal size. When fully developed, the fetus generally weighs about seven pounds. The usual variation is from four to ten pounds.

HYGIENE OF PREGNANCY.

Parturition without Pain.—According to the Bible, the pains of childbirth constitute a part of the curse pronounced upon woman in consequence of the transgression of mother Eve in Eden. We are thoroughly convinced, however, that the curse of fashion, and the long list of perverting influences which have for ages been telling upon the human constitution, are far more responsible for the terrible agony frequently attendant upon the bringing of a human being into the world than the original curse. But regarding pain as a penalty for sin, some over-conscientious people have thought it not only useless but even irreverent and sinful to make any attempt to mitigate the sufferings of childbirth. We do not regard this objection of sufficient force to be worthy of serious attention, and are thankful to be able to say to the thousands of mothers who often go so near to death's door for the purpose of bringing into life another, that it is possible, in a very great degree, to ameliorate their sufferings. We have known of some cases indeed, in which by proper care and treatment during pregnancy the pain was almost entirely banished. In one instance, the lady declared that she suffered no pain whatever. We will now call attention to a few of the most important points to be observed for obtaining this desirable end.

Exercise.—Moderate and regular exercise should be taken during the whole period of pregnancy, even to the last. The habit many women have of sitting or lying most of the time for several months

is a very injurious one, as the muscles become weak, while the general health is seriously impaired. Childbirth is a process which is chiefly due to muscular action. In the performance of this act, the muscles of the abdomen and other parts of the trunk, as well as the womb, are involved, and hence anything which weakens or strengthens the muscles will materially affect the parturient process. Some of the easiest childbirths we have ever known were in the cases of poor women who were obliged to do their own house-work, and continued to do so up to the very time of confinement.

When the patient is for any reason too feeble to walk, ride, or take much vigorous exercise of any kind, daily passive exercise should be given in the form of massage and Swedish movements. Care should be taken never to over-do the matter, however, so as to occasion exhaustion.

At certain periods, as about the third or seventh month, special care to secure rest and quiet should be observed, owing to the liability to miscarriage at the former period, and premature birth at the second.

Diet.—The food should be nourishing, but simple and unstimulating. Tea, coffee, beer, ale, porter, and stimulants of all kinds, should be avoided. Little if any meat should be taken. Inflammation or degeneration of the kidneys is a not very infrequent occurrence in pregnancy, and is encouraged by the use of meat. The "longings" for various articles of food (many of which are of an unwholesome character) experienced by many women when in this condition, should not be considered an imperative indication of what should be allowed. The idea that the infant will be "marked" or possess some deformity if "longings" are not satisfied, is an error. The patient should be denied unwholesome articles, no matter how strong the craving for them, as the desire for them cannot change their character or their relations to the body. Such food as oatmeal, cracked wheat, and other whole grain preparations, together with an abundance of fruit, should be freely used, not only as a means of securing proper activity of the bowels, but because these foods furnish the elements most essential to nourish the developing infant.

Dress.—The dress should be suitable to the season, the body being clad in such a manner as to secure thorough and equable protection. It should not constrict the body of the wearer in any part, particularly about the waist. The Grecian lawgiver Lycurgus made a law re-

quiring all women when pregnant to wear very loose clothing. The ancient Romans enacted laws to the same effect. When the enlargement of the abdomen becomes very great, the wearing of a wide bandage cut to fit the abdomen and applied in such a way as to support it somewhat, will be found very conducive to the comfort of the patient.

Bathing.—General baths should be taken as often as necessary for cleanliness, as from one to three times a week. Sitz baths are especially advantageous. They should be taken all through the period of gestation, two or three times a week, and during the last few weeks of pregnancy should be taken daily. This is a most excellent means for relieving many of the local ailments from which women suffer during this period, especially those who are also subject to chronic disease of the womb. We do not know of any one means by which so much suffering at the period of childbirth may be obviated as by the persevering employment of sitz baths. We have often recommended this measure to those who were accustomed to suffer very severely at childbirth, and never without very satisfactory results.

Care of the Breasts.—Attention should be given to the breasts during the period of pregnancy, as by this means much trouble and inconvenience may be avoided after childbirth. They should be carefully protected from the pressure of tight clothing, and if painful may be soothed by means of anodyne liniments. When the nipples are sunken and retracted, they should be frequently drawn out by means of a breast-pump. When the skin of the nipple and of the breast in the immediate vicinity is tender, it may be hardened by applying twice a day a strong solution of alum or borax in whisky, or a solution of sulphate of zinc in the proportion of five grains to the ounce of water.

Mental Conditions.—The mind should be kept in a cheerful frame by kind and cheerful surroundings which will be conducive to evenness of temper. Although a woman in this condition is often in a very unnatural mental state, being fretful, petulant, and peevish, without anything more than an imaginary cause, she should be treated with the utmost kindness, and her mind should be, so far as possible, diverted from the event to which she may look forward with very great apprehension, especially if she has ever suffered a severe labor. The importance of control of the mind on account of the effect of the mental status of the mother upon the impressible mind of the infant has been fully considered elsewhere. See pages 341–344. Another point which should be mentioned in this connection is the propriety of sexual continence during

this period. This is the invariable rule in lower animals, and should be with human beings; a disregard of it is a frequent cause of abortion. An eminent gynecologist remarks that "if any obstetric authorities give their passive or implied consent to intercourse in pregnancy, it is like the story of Moses' concession to the hardness of human hearts."

LABOR, OR CHILDBIRTH.

The duration of pregnancy is generally from 278 to 300 days. At the end of this period, labor or parturition occurs, the process by which the new human being is brought into the world. This process sometimes begins suddenly, but generally gives indications of its approach for some days or at least hours beforehand.

The symptoms of the approaching conclusion are gradually increased irritability of the bladder, with much difficulty in standing or walking, and a change in form of the abdomen which results from the settling down of the womb, leaving the waist smaller, but increasing the prominence of the lower portion of the abdomen a short time before the labor is to begin. Also the external parts become swollen, and there is a leucorrhœal discharge of a thick, clear matter somewhat resembling the white of an egg. Uterine contractions, quite painless in character, are also indicative of the approaching crisis. These contractions at first occur at irregular intervals. When they become regular, the labor has begun. The pains usually begin in the back and sacrum, and extend to the front part of the abdomen. What are termed false labor pains arise from colic, constipation, or irritation of the bowels. They differ from labor pains in being irregular. The term pain, as used in obstetrics, is applied to the spasmodic uterine contractions which take place, together with the pain incident to the same.

Presentation and Position. — The term *presentation* has reference to the particular part of the body which presents at the mouth of the womb. The term *position* has reference to the location of the presenting part in the passages of the mother. The most usual presentation is the head. Occasionally the other extremity of the trunk takes precedence, forming what is termed a "breech presentation." In still other cases the body lies crosswise of the outlet, a presentation which must be modified in some way, before the infant can be born.

There are various modifications of each of these classes of presentation, that is, other parts of the head may present. In a perfectly natural labor, the vertex of the head is the presenting part. But vari-

ous other parts of the head may be presented, more or less complicating the process.

Stages of Labor.—The labor is divided into three stages:—

1. Dilation of the mouth of the womb. This is indicated by cutting pains felt mostly in the back, contractions taking place in the womb only, and gradually growing more and more frequent until the neck of the womb is fully dilated.

2. Expulsion of the child, by means of stronger contractions in which the abdominal muscles contract, as well as the uterus.

3. The expulsion of the after-birth.

The average length of labor in women who have previously borne children is about six hours, the first four of which are occupied in the first stage, and the latter two in the second stage. The after-birth is often expelled at once after the expulsion of the child, but is more often retained five to thirty minutes.

The first and second stages of labor are generally considerably prolonged. Some women, especially those who have broad hips and are well adapted to childbirth, pass through the process of labor in a much shorter space of time, in some cases not more than thirty minutes or an hour being occupied. In women who have not borne children before, especially those who are somewhat advanced in life, labor is often very greatly prolonged.

Various obstacles frequently arise to delay the process; such as, inactivity of the womb, rigidity of the neck of the womb or of the perinæum, and contracted pelvis.

Management of Labor.—In the first place, the services of a competent attendant should be secured. The attendant should, if possible, be a thoroughly trained physician. This is a field in which woman as a physician can fill a very useful sphere. Under no circumstances, except in emergencies, should the important process of parturition be placed wholly in the hands of a midwife whose qualifications, such as she may possess, are wholly derived from experience at the bedside, no matter how large may be the number of cases she has attended. No one person could by practical experience alone in a life-time acquire all the knowledge necessary to meet the urgent emergencies which are liable to arise at any time in childbirth. The science and art of obstetrics have been developed by a very slow process, and as they exist at the present day, are the result of the

combined experience of physicians during the last two thousand years. Thorough theoretical knowledge is indispensable as a foundation for practical skill. This, of course, must be supplemented by actual experience.

As soon as the first labor pains make their appearance, the physician should be promptly notified, and also the nurse, if the latter is not already present. The room in which the patient is to be confined should be a large, light, airy, and pleasant one. But few persons should be allowed to be present, and these should be such as are desired by the patient, and no others.

So far as consistent, all her wishes should be complied with, so that she may be in as pleasant a state of mind as possible, and that no mental influence may present an obstacle to prevent the completion of the process in which her physical and nervous powers will be taxed to the uttermost. No remark of a discouraging nature should be uttered in the presence of the patient, but hope and confidence should be inspired.

During the first stage the patient need not go to bed. In fact, it is better that she should sit up, as the sitting posture favors the progress of labor. This need not be required, however, if the patient prefers to be in bed. During this stage the patient should quietly allow nature to carry on the work without any attempt to hasten matters by "bearing down," as she may often be encouraged to do by ignorant friends. These voluntary efforts are of no consequence until the neck of the womb is fully dilated. The patient should be allowed to drink cold water, or weak lemonade, as freely as desired; but stimulants should not be given, as they will produce a feverish state of the system without giving any real strength. Hot teas are also better withheld. If the bowels have not moved freely, they should be relieved by a full enema.

During the first stage, the bed should be made in readiness. The feather bed, if in use, should be removed and replaced by a moderately hard mattress. Over this should be placed a large rubber cloth three or four feet wide and six feet long. This should be covered with a comfortable, and a sheet placed over all.

At the beginning of the second stage the patient should go to bed, and her clothing should be drawn up under her arms so that it will not be soiled, the lower portion of the body being protected by a sheet or petticoat. The patient may lie on the left side or on the back. If

the fetus is strongly inclined toward the right side, it is better for the patient to lie upon the left side. During the severe pains which characterize the second stage of labor, the back of the patient should be supported by firm pressure with the hand. The knees should be drawn up, and fixed in such a position as to give them support during the pains. The nurse should take hold of the hand or wrist of the patient to give her an opportunity to make firm traction during the pain. In the intervals between the pains, if the patient is exhausted, she should be allowed to sleep, if possible, in order to recuperate her strength. When the face becomes hot and flushed, it should be bathed with cool water. As the termination of labor approaches, as indicated by the increasing severity and frequency of the pains which at this time often become almost continuous, a supply of hot water should be got in readiness, a large pailful being brought to the bedside, together with a large pan, to be ready for any emergency. A syphon syringe should also be filled with hot water and held ready for use. A bottle of camphor should also be at hand, and a strong cord, made of silk or linen thread twisted and well waxed, with a pair of scissors, should be in readiness for prompt use.

As the head of the child presses severely upon the perinæum, the efforts of the patient should be restrained, to avoid rupture by giving the tissues time to dilate. As soon as the head passes out, the cord should be felt for, as it is sometimes wound around the neck in such a way as to interrupt the circulation as the strain is brought to bear upon it. It also sometimes happens that knots are tied in it, which being tightened by the strain may cut off the supply of blood from the child too soon. If the body is not speedily expelled, the child may be withdrawn by making traction with the finger placed in the armpit.

As soon as the child is born, the hand of the nurse should be placed upon the abdomen of the mother in such a way as to grasp the upper part of the womb, firm pressure being made for the purpose of securing contraction of the organ. This pressure should be kept up until the after-birth is expelled and the bandage applied.

The child should be brought to the edge of the bed as soon as it is born and examined. Generally it at once utters a cry, which indicates that its lungs are filled with air. In case it does not cry and breathes feebly, or only gasps, the hand should be dipped in cold water and placed upon its chest, or the chest may be slapped with the hand. This will generally be sufficient to start the respiration. If the child

is limp and pale, and makes no efforts whatever at respiration, it should be immediately inverted, being held with the head downward, and hot flannels should be wrapped about it. Efforts should be made to excite respiration by compressing the chest at intervals of a few seconds. Care should also be taken to see that the mouth is cleared of mucus, though this is not likely to be necessary unless the child has begun to breathe just as the head is being born and has drawn mucus into the throat. If the face has a purplish appearance, the child should be placed at once in a warm bath of a temperature of 105°, or as hot as can be safely used without injury to the skin, and cold water should be dashed upon the chest. Artificial respiration may also be employed at the same time. These measures should be continued for some time and should not be abandoned so long as any evidence whatever of the action of the heart can be obtained. Some cases are recorded in which infants have been resuscitated after apparent death had continued for fully an hour.

As soon as it breathes freely the cord should be tied in two places; the first about two inches from the body, the other about three inches. The child should then be laid upon its side, not on the back, as the side position favors the escape of mucus from the throat. If there should be much rattling in the throat, indicating the presence of considerable mucus, the infant should be laid with its head downward and to one side, so as to allow the mucus to escape.

Washing and Dressing the Child.—If the birth is a premature one, having occurred before the infant was fully developed, the child will be smaller than usual and less well developed; its movements will be slight and feeble, and its cry will be very faint, and the countenance will have a peculiarly old expression. Such a child requires extra care and warmth. It should be carefully wrapped in soft cotton. Very great care will be required in rearing it, as it will at first be too weak to nurse and must be fed with a spoon. It should not be washed and dressed for some time, and should be kept very warm. Care should be taken in washing the child not to expose it to cold so as to produce blueness of the surface, as is often done. It should be recollected that the infant has all its life thus far been accustomed to a temperature of nearly 100°, and being wholly without protection when born, and keenly susceptible, it must suffer quite severely from cold.

The best plan is to place the child in a warm bath, the temperature of which is about blood heat, and then rub it gently with a sponge dipped in warm, weak suds made of castile soap. If the surface is covered with curd-like matter, as is sometimes the case, it should be smeared with a mixture of equal parts of egg and sweet oil beaten up together. After the bath, the surface of the skin should be anointed with a little olive oil or vaseline. If some portions of the curdy matter seem to be firmly adhesive to the skin, no violent efforts should be made to remove them, as they will dry up and disappear in a short time without further attention. After being thoroughly washed, the child should be carefully examined to see that it possesses no deformity. The outlets of the body should receive particular attention, as in some cases the anus or urethra are closed.

The best method of dressing the cord is this: Grasp the cord with the thumb and finger close to the body, cutting it off at the ligature. Squeeze out all its contents by pressure with the thumb and finger of the other hand, keeping a firm grasp upon it with the thumb and finger first applied so as to prevent hemorrhage. Now apply another ligature about an inch from the end of the stump. By this means the cord will be very greatly reduced in size and may be much more easily dressed than when treated in the usual way. In dressing, apply a soft thin muslin bandage, about as wide as the first joint of the thumb, wrapping it around the cord three or four times. Now apply another ligature outside of the bandage, and the dressing is complete. Some prefer to apply for a bandage a soft linen cloth four or five inches square and having a hole in the center through which the cord is slipped. (For most recent method, see Appendix.) The cloth is generally scorched, by which means it is sterilized. By dressing the cord in this way, much offensiveness which arises from decomposition is avoided. It is generally customary to next apply what is termed the belly-band. This is not so important as many suppose, if indeed it is needed at all, which we very seriously doubt. If applied, it should not be drawn too tight, and should be fastened with tapes instead of pins. The best material to use is very soft flannel. When the dressing is completed, the infant should be placed in a warm bed; but it should not have its head covered, as it needs an abundance of air, as well as adults. The infant, when thus properly dressed, generally sleeps several hours. When it awakes, it should be applied to the breast. Although the milk is not yet

formed, the efforts of the child to nurse will promote the secretion and will also benefit the child, as the first secretion furnished by the breast, a watery fluid known as *colostrum*, has a slightly laxative effect upon the bowels of the infant, freeing them from their dark green contents, which is termed *meconium*.

The Binder.—After the child has been born and its immediate wants attended to, the binder or abdominal bandage should be applied to the mother. The binder consists of a double thickness of strong muslin cloth or a large linen towel. It should be applied in such a way as to give the mother the least possible amount of inconvenience in the application. In fastening, it should be drawn so as to fit the body snugly and should be pinned from before downward. The bandage is generally applied more tightly than is necessary, the serious consequence of which is not infrequently prolapsus of the womb. In case there is any marked tendency to hemorrhage after the birth, a folded towel should be laid over the womb beneath the bandage. The soiled clothing should next be removed. The patient should be washed and wiped dry, and a dry clean sheet with old cloths for absorbing the discharges should be placed beneath the patient. Care should be taken that the patient is warmly covered. A slight shivering will often occur, but this is generally from nervousness. If the patient has lost much blood or is very weak, the head should be placed low ; only a very small pillow or none at all should be used. The patient should now be allowed to rest. Simple drinks may be allowed at pleasure, but stimulants are rarely called for. The patient will generally fall asleep if allowed to do so, and will awake after two or three hours very much refreshed. Food may be taken at regular times, but should be simple and unstimulating. Milk, toast, oatmeal porridge, and occasionally soft boiled eggs, should constitute the chief diet. Beefsteak and other meats are better avoided.

Attention should be given to the bowels and bladder. If the bowels do not move by the second day, an enema should be administered. Either tepid water or flaxseed tea may be employed. The bladder should be emptied within a few hours after labor. If there is inability to urinate, a warm fomentation may be applied over the bladder between the thighs, or a warm douche administered. This will usually bring relief, especially the latter measure, the patient being directed to urinate while the douche is being given. If these simple measures do

not succeed, it will be necessary to use a catheter. The bladder should be relieved two or three times a day.

For the first day, the discharge from the womb is of a bloody character; after this, it gradually becomes watery, and in from three to five days it becomes thicker. This is termed the *lochial* discharge, and generally continues from one to three weeks. It is often checked for a day or two at the time when the milk secretion begins. In order to prevent the discharge from becoming offensive, as is sometimes the case, the vaginal douche should be taken at least twice a day; and when the discharge is very profuse, more frequently. The water employed should be quite warm, and should contain a teaspoonful of carbolic acid dissolved in a tablespoonful of glycerine or alcohol to the quart of water. The injection of hot water not only cleanses the parts, but stimulates complete contraction of the tissues, and thus prevents danger from hemorrhage, and hastens the process by which the organ returns to its natural size. A solution of permanganate of potash in the proportion of a teaspoonful of the crystals to a gallon of water, is also an excellent injection for use when the discharge is offensive. The carbolic acid solution should be thoroughly shaken before it is used. When blood reappears in the discharges after a few days, it is an indication that the process referred to is not taking place regularly and satisfactorily. This is generally the result of the patient's getting up too soon.

Milk Fever.—This is a term applied to the feverishness which is sometimes present on the third day after confinement. The fever may be introduced by a slight chilliness. The patient has thirst, headache, and frequent pulse. The breasts are generally somewhat swollen, harder than natural, and sensitive; throbbing and darting pains are sometimes felt in them. It is probable that the fever is not the result of the milk secretion, but is due to the absorption of decomposing discharges through the raw surfaces of the vagina and womb. The thorough use of disinfectant injections will generally prevent a recurrence of this fever.

Allowing the child to suck the breast soon after birth, and at regular intervals afterward, is also an excellent means of prevention. The treatment at this time should consist in giving the patient little fluid to drink, feeding her chiefly with solid food, and quenching the thirst by means of pieces of ice. Hot fomentations should be applied to the breasts, and they should be emptied by means of

massage, unless the child is able to withdraw the secretion by nursing. Sometimes the swelling is so great that the nipple is partly buried, thus interfering with the nursing. In this case the breast-pump should be employed to draw out the nipple, or a nipple shield with a rubber teat should be employed. In the absence of either one, an adult may act as a substitute for the child.

Care of the Breasts.—If the breasts have been properly cared for during pregnancy, little inconvenience will be experienced after childbirth. Care should be taken to wash the nipples carefully with cold water both before and after nursing. If the breasts are large, flabby, and pendulous, it is well to support them by means of bandages properly applied, passing under the breasts and over the neck. This precaution will often prevent inflammation of the breasts.

Sore Nipples will rarely occur when these precautions are observed. If the nipples should become cracked and tender, especial attention should be given to cleansing, both before and after nursing, and an ointment of carbolated vaseline, ten drops to the ounce, should be used, care being taken to remove the ointment before the nipple is given to the child. A solution of tannin in glycerine, fifteen grains to the ounce, is also an excellent application for sore nipples. It should be used twice a day. Another excellent remedy is the following lotion, which should be applied twice a day with a camel's hair brush: Carbolic acid twenty drops, glycerine two teaspoonfuls, water a tablespoonful and a half; mix thoroughly. Care should also be taken to give the nipple as much rest as possible, by using the breasts alternately, and making the intervals between nursing as long as possible without doing injury to the child. One of the greatest causes of sore nipples is compression of the breast by improper dressing before and during pregnancy. In some cases, severe pain may be felt whenever the child is taken to the breast, in consequence of neuralgia of the part. This should be carefully distinguished from soreness of the nipple by a critical examination of the breast.

Inflammation of the Breast.—If swelling of the breast occurs, accompanied by redness, pain, and tenderness, the breast should be given entire rest at once. Hot fomentations should be applied until the pain is relieved. The fomentations should not be simply warm, but they should be as hot as can be borne. If relief is not obtained in this way, ice compresses or an ice-pack should be used. We generally obtain better

results by means of alternate hot and cold applications than by the use of either one alone. If one alone is used, the packs or compresses should be renewed once in a half hour for fifteen or twenty times, in order to prolong the good effect. At the very beginning of the difficulty, before inflammation has really begun, relief may frequently be obtained by carefully withdrawing the milk and rubbing the breast gently with the hand. If suppuration occurs, as indicated by the softening of the hard cake which forms when the inflammation rises high, poultices should be applied. It is also best to call a physician in this case, as it is frequently necessary to lance the abscess which has formed. Blisters, mustard plasters, leeches, and other irritating applications, are of no value whatever. Inflammation of the breast may almost always be prevented by care on the part of the mother to avoid allowing the breast to become too full. On this account, regularity in nursing is of great importance.

To Check the Secretion of Milk.—In some cases it becomes desirable that the secretion of milk should be checked. This is especially important in cases of still-birth. The most effective measure for checking the secretion of milk is to require the patient to abstain from the use of fluids of any sort. The food should be of a solid character. The thirst may be relieved by taking small quantities of ice. This should be continued until the fourth or fifth day, when there will usually be no further difficulty. The breasts should be partially relieved of their contents by the breast-pump or other means, but should not be entirely emptied. The application of the ice-pack or cold compresses to the breasts, is also an excellent means for diminishing the secretion. It is also a good plan to apply to the breasts two or three times a day a mixture of equal parts of sweet oil and spirits of camphor, and to keep the breasts constantly covered with a cloth saturated with spirits of camphor.

To Promote the Secretion of Milk.—This must be accomplished chiefly by regulation of the diet and attention to the general health, especially to the improvement of the digestion. The patient should make free use of liquid food, particularly fresh milk, sweet cream, oatmeal porridge, graham gruel, and other whole-grain preparations. Teas of various kinds are of little consequence and do not increase the quantity of milk except by the addition of water. The use of wine, beer, ale, and other alcoholic stimulants is a practice to be in the highest de-

gree condemned, as it not only deteriorates the quality of the milk, but makes the child liable to various diseases. An eminent physician declares that in many instances in which beer and ale are used, the infant is not sober a moment from the time it begins nursing until it is weaned.

Gentle manipulation of the nipple in imitation of the act of milking is in many cases very efficacious in promoting the secretion of milk. By this means, the secretion has been produced in women who had never borne children, and even in young girls and men in such a quantity as to enable them to perform the part of wet-nurse with entire success.

It is said the function of lactation is possessed by many men in Russia. Some years ago a negro slave appeared before the class in a Southern medical college, who had a profuse secretion of milk from one breast, and had acted as wet-nurse for all the children of his mistress.

Getting Up.—No definite time can be set at which it would be safe for every woman "to get up." Some are as able to be up in three or four days, as others at the end of two weeks. The traditional "nine days for lying in," has no substantial foundation. As a general rule, the woman should remain recumbent in bed for a week or ten days. If she has been getting along nicely, she may be permitted to sit up a few minutes after the fourth or fifth day while the bed is being changed and aired; but if the lochial discharge becomes bloody after being up, it is an indication that she should remain in bed some time longer. Getting up too soon after confinement is a frequent cause of some of the most troublesome chronic ailments from which women suffer. The worst of these is enlargement of the womb, due to *sub-involution*, a condition in which the organ fails to return to its natural size, remaining permanently enlarged. When everything progresses well, this process generally takes place in six or eight weeks. During this time the patient should exercise very great care to avoid exposure of any kind. Getting the feet wet, being chilled, overexertion of any kind, either mental or physical, and anything which has a prostrating effect, will be likely to check the natural retrograde process, the prompt and thorough performance of which is very important. Special care should be taken so long as the lochial discharge is still present. Care during this period will often save the patient from many years of suffering.

Hemorrhage after Labor.—Sometimes the womb does not contract as firmly as it should after childbirth, in consequence of which its greatly dilated blood-vessels remain open, and frightful hemorrhage is the result. This is also sometimes caused by only partial separation of the after-birth, the remainder of the after-birth being attached so firmly that it cannot be expelled by the contractions of the organ.

Treatment.—When the hemorrhage is due to partial attachment of the placenta, the after-birth should be removed as quickly as possible. In order to effect this, it is sometimes necessary for the physician to pass his hand into the womb. The necessity for this measure may almost always be obviated by the employment of the hot-water douche at as high a temperature as can be borne by the patient. Where hemorrhage is due to failure of the uterus to contract, the best remedy known is the hot-water douche. The syphon syringe, or some other efficient instrument of the kind, should be in readiness for use in an emergency of this sort. The water employed should be as hot as can be used without burning the tissues. This remedy is generally quite promptly effective.

Uterine contraction may also be stimulated by alternate hot and cold applications to the abdomen over the womb, and to the breast. Care should be taken by the nurse to examine the patient frequently after childbirth to see that there is no unusual hemorrhage.

Retention of the After-Birth.—The condition referred to in the preceding paragraph sometimes occurs in consequence of failure of the uterus to contract properly after the child has been born, or in consequence of an unusually firm attachment of the placenta to the internal walls of the uterus. As previously remarked, the after-birth is generally expelled from five to thirty minutes after the child is born. When the uterine contractions suddenly cease after the child is born, so that the placenta is not expelled, the remedies suggested for inactivity of the womb should be applied, one of the most effective of which is the hot-water douche. In case these are not effective, it becomes necessary for the physician to pass two or more fingers into the womb and by gradually working them under the placenta, loosen it and bring it away. This is a frequent cause of hemorrhage after childbirth, the treatment for which has already been given.

Inactivity of the Womb.—When labor is delayed in any of its stages in consequence of failure of the uterus to contract with suffi-

cient vigor, it is necessary to adopt means for the purpose of stimulating the contractions. Among other simple measures which may be applied with advantage are the application of cold water to the breast and over the abdomen. Sometimes alternate hot and cold applications are more effective than cold alone. Sometimes the inactivity is due to exhaustion, and rest is needed. In such cases, the patient should be allowed to sleep, if possible, and should be given food. In case of very great weakness, a small quantity of some form of local stimulant may be taken without detriment, and probably with advantage.

Electricity is a very useful agent in cases of this sort. The positive pole should be applied to the back and the negative over the womb. The hot vaginal douche is one of the most effective measures for use in these cases.

Rigidity of the Womb.—In some cases labor is delayed by a failure of the neck or mouth of the womb to dilate with sufficient rapidity. This is sometimes due to an early rupture of the membranes, in consequence of which the "bag of waters," which precedes the child as it passes downward, does not perform its usual and important function of dilatation. It is also sometimes due to an unnatural condition of the tissues of the neck of the womb. In these cases the pains are very severe and acute, being felt mostly in the sacrum. The patient is feverish and very restless, the pulse becomes very frequent, and the patient suffers great distress. By internal examination, the os, or mouth, of the womb is felt like a hard ring.

Treatment.—The best remedies for this condition are the hot sitz bath and the hot vaginal douche. They may be continued for several hours if necessary without detriment. Large hot enemas are also very useful in this condition. They should be retained as long as possible.

Rigidity of the Perinæum.—In this condition, the perinæum, or portion of the tissue between the vagina and rectum, does not dilate as it should, but the central portion bulges forward while the upper edge remains hard and unyielding. This is the most frequent cause of rupture of the perinæum. The best remedies are the hot sitz bath and hot fomentations to the parts. A very excellent way of applying moist heat is by means of a large sponge dipped in hot water, and applied as hot as it can be borne. The hot-water douche and the hot enema are remedies of very great value. The employment of daily

sitz baths during the later months of pregnancy is a very excellent means of preventing this complication.

After-Pains.—In some cases, contractions of the uterus continue for a longer or shorter period after labor is completed. When these contractions are so severe as to give the patient great discomfort, hot fomentations should be applied over the abdomen. The hot vaginal douche is also an excellent means of relieving after-pains by producing firm contraction of the womb.

The Use of Ergot.—This drug, once very popular, indeed thought to be almost indispensable in all cases of childbirth, is now charged by many of the most eminent obstetricians with being the cause of much increase of suffering during childbirth, and serious subsequent disease. It has often been the cause of ruptures of the neck of the womb and of the perinæum by producing too rapid labor. If used at all, it should be only in difficult labor. It is probable that its use can be dispensed with in most, if not all, cases, without detriment to any, and with benefit to many.

The Use of Anesthetics.— The employment of anesthetics in childbirth is a practice of very recent date. When it was first introduced, many fears were expressed that harm would result to either mother or child, or both. Some opposed the measure on moral grounds, claiming that the pains of childbirth were part of the curse pronounced upon Eve, and that the use of anesthetics for the purpose of mitigating the pain was preventing the execution of the penalty. Yet, notwithstanding the opposition, some form of anesthetic, generally chloroform, is now very largely used, especially in prolonged and unusually painful labors. If the patient is strong and vigorous, and the labor is not unusually severe, there is no occasion for the use of the anesthetic; but if the contrary of this is true, there is no question but benefit, as well as comfort, may be derived from the judicious use of chloroform. It is unnecessary to produce profound anesthesia, or to bring the patient fully under the influence of the drug, and hence there is little or no danger of immediate injury to the patient. Neither have those opposed to the use of chloroform been able to show that injury results to the child. It should never be used, however, without the advice and constant supervision of the physician.

Twins.—Twin pregnancy may be suspected when the mother is unusually large, or when there is a double appearance of the enlarged

abdomen. Twin birth occurs in proportion of about one to seventy or eighty single births. The usual unpleasant symptoms which occur during pregnancy are greatly exaggerated in twin pregnancy. Complicated labors are also somewhat more frequent in twin births. The birth of the second child generally succeeds that of the first very quickly, but cases have been observed in which several hours and even days have elapsed before the birth of the second child.

Abdominal Pregnancy.—It sometimes happens that the impregnated ovum finds its way into the abdominal cavity and there undergoes development; fortunately, occurrences of this kind are very rare. In many cases, the fetus becomes surrounded with a cyst, by means of which it is separated from the rest of the body, and sometimes may be thus preserved for years in a degenerated condition.

In other cases, the different portions of the fetus gradually work out through the bowels, or even through the abdominal wall. In still other cases, decomposition and suppuration take place, the system becomes infected with the products of decomposition, and the patient dies of blood poisoning. Cases have occurred in which, by the performance of a surgical operation, a fully developed child has been removed from the abdominal cavity, the lives of both mother and infant being saved.

Milk-Leg.—This distressing malady usually appears about ten days after confinement. It is usually ushered in by a chill which is speedily followed by pain in the groin, and extending down the leg of the affected side. The limb becomes swollen, hot, white, and shining. The flesh yields to the finger, but does not "pit."

Treatment.—Elevate the limb by supporting the calf upon a soft cushion one foot above the level of the body. Apply hot fomentations and hot sponging to the limb almost constantly. Subdue the fever by cool sponging of the body, cool enemas, and cool compresses to the bowels. Keep the bowels open, and give the patient light, nutritious diet, as milk, gruel, toast, etc., but no flesh food of any kind. After a few days, the limb will begin to "pit" on pressure with the end of the finger. Now make hot and cold applications, and three or four times a day rub the limb upward, keeping it bandaged all the time when not being sponged or rubbed. The bandage should be made of rubber or flannel cut cornerwise of the cloth, and the leg should be evenly bandaged from the toes up. Some time is required for the limb to recover from the effects of the attack.

DISORDERS OF PREGNANCY.

Constipation can generally be relieved by regulating the diet, which should consist chiefly of fruits and grains. Drinking a glass of cold water before breakfast is an excellent means of securing a regular evacuation of the bowels. In case these measures are insufficient, the enema may be resorted to. As small a quantity of water should be used as will secure the desired movement. It is also better to employ water at a moderately low temperature, so as to keep the blood-vessels of the part well closed, as a means of preventing hemorrhoids. A very excellent plan by which the dependence upon the enema may be somewhat avoided, is to inject into the rectum at night, just before retiring, two tablespoonfuls of water containing ten drops of spirits of camphor. This will often provoke a movement of the bowels at once. If the fluid is retained over night, it will be quite certain to secure a prompt movement. Figs, stewed prunes, and other fruits of a laxative character, if freely used by the patient, will generally obviate the necessity for other means. It is very unwise to become dependent upon the use of the enema, and hence a persevering effort should be made to secure activity of the bowels by regulation of the diet. (See page 913.)

Piles, or Hemorrhoids.—This troublesome difficulty is a very frequent accompaniment of pregnancy. It is generally the result of constipation of the bowels. When this is the case, the bowels should be kept loose by means of enemas of linseed tea or soap-suds. In case there is a tendency to hemorrhage from the rectum, an ointment containing a dram of tannin to an ounce of vaseline should be used after each movement of the bowels.

Morning Sickness.—Nausea and vomiting in the morning soon after getting up, is one of the early symptoms of pregnancy, and is also characteristic of its later stages. The best method of treatment is to give the patient something to eat before getting up in the morning, as a bowl of brown bread and milk. The patient should eat at least fifteen or twenty minutes before attempting to get up, and upon arising should dress quickly and go out in the open air for a walk, unless the weather forbids.

The abdominal bandage is a very excellent means of relieving this unpleasant symptom. It should be worn constantly for a week or two,

and then omitted during the night. Daily sitz baths are also of great advantage. In many cases, electricity relieves this symptom very promptly. When nearly all kinds of food are rejected, milk and lime-water may be employed. In very urgent cases in which the vomiting cannot be repressed and the life of the patient is threatened, the stomach should be given entire rest, the patient being nourished by means of nutritive injections. (See page 737.) Fomentations over the stomach and swallowing small bits of ice, are sometimes effective when other measures fail.

Various other disturbances of digestion occur, due to the development of various forms of dyspepsia. Severe pain in the stomach is often a very ominous symptom. When present, the attention of the physician should be called to the fact.

Disorders of the Bladder and Womb.—Various disorders of the bladder and womb are frequent during the pregnant state. Irritability of the bladder, or painful micturition, incontinence of urine, retention of urine, are the most common troubles of this sort. Irritability of the bladder is most generally due to neglect to empty the bladder of its contents with frequency and regularity. In some cases, the bladder troubles are due to displacements of the womb existing before pregnancy occurred. This is especially true of incontinence of urine, which generally results in these cases from pressure upon the bladder by the enlarged womb. Prolapsus of the uterus and retroversion are difficulties which sometimes complicate pregnancy and require the attention of the physician. The irritability of the bladder is generally relieved by copious water-drinking, the free use of fruit, and relieving the organ regularly once in five or six hours. The recumbent position is the best remedy for incontinence of urine. Sometimes this difficulty may be prevented by the use of the abdominal bandage for the purpose of holding the uterus in place.

Itching Genitals.—This difficulty should be treated according to directions given elsewhere. (See page 1330.) It is almost always accompanied by leucorrhœa, which should also receive proper treatment.

Vaginal Discharges.—The discharges which take place from the vagina during pregnancy are quite various. The most common is a profuse mucous discharge, or leucorrhœa, the best remedy for which is the daily use of vaginal injections administered with the syphon syringe. The water should be at the temperature of the body, and little force

should be employed. Various remedies elsewhere recommended for leucorrhœa are useful in this form of the difficulty.

Occasionally strong gushes of a watery fluid occur, followed for some time by a dribbling of the same. The remedy for this difficulty is complete rest. Fluid discharges occurring during pregnancy should receive prompt attention, as they may indicate a liability to miscarriage.

Varicose or Enlarged Veins.—Varicose veins of the lower extremities are of very frequent occurrence in pregnancy, being produced by the pressure of the enlarged womb upon the veins which return the blood from the lower extremities. Sometimes a similar enlargement of the veins of the external organs of generation on one or both sides also occurs.

Treatment.—The limbs should be supported by means of an elastic bandage, or elastic silk stocking, whenever the patient is on her feet. A flannel bandage made of strips of flannel torn across the web so as to give some elasticity may be used in place of the rubber bandage. The bandage should be applied evenly, from the toes upward, as high as necessary, even extending to the body in some cases. When the patient is sitting or lying down, the feet should be elevated a little higher than the hips if possible. If the labia become very much swollen, the patient should remain as much as possible in a horizontal position, in the meantime pressing out the blood from the distended veins by steady compression with the hand. A pad and bandage can be adjusted in such a way as to answer the same purpose.

Dropsical Swelling of the Feet and Limbs.—General dropsy, indicated by swelling of the limbs so that pitting is produced by pressure with the finger, and puffiness of the face, is a very serious complication of pregnancy, indicating inflammation of the kidneys. This condition should receive prompt attention. The most useful remedies are such as will induce active perspiration. The patient should be allowed no animal food except milk, the diet being made up chiefly of fruits and grains. Water should be taken abundantly, to encourage the action of the kidneys, and the daily sweating bath is also useful.

Difficult Respiration.—Shortness of breath or difficulty of breathing, are frequently among the most prominent inconveniences of the later stages of the pregnant state. Patients subject to asthma, and suffering with organic disease of the heart, suffer much more than do others. The interference with respiration is produced in most cases by

crowding upward of the abdominal organs against the diaphragm, thus preventing its descent, and making it impossible for the patient to take a full inspiration. Shortness of breath is sometimes due to poverty of the blood.

The first class of cases can be relieved but little, as the cause cannot be removed. Some advantage may be derived, however, by the application of faradization to the chest, for the purpose of strengthening the respiratory muscles. In cases in which the difficulty arises from debility, the patient should receive such treatment as will secure improvement of nutrition.

Fainting in some cases occurs quite frequently during the first few months of pregnancy. This is simply due to the morbidly susceptible condition of the nervous system during this period, very slight disturbances being sufficient to occasion intense mental excitement and profound disturbance of the circulation.

Headache and Disturbance of Sight.—Severe continuous headache and various disturbances of vision, such as blurring, double sight, etc., are sometimes of quite serious import. These cases should be investigated by a competent physician. Whenever these symptoms occur, a careful examination of the urine should be made, to determine if albumen is present. The headache may generally be relieved by cool or hot compresses and derivative measures.

Neuralgia.—The neuralgia of pregnancy is sometimes one of the most disagreeable features. It may assume a great variety of forms. It most frequently affects the face. Very often the teeth are the seat of the pain.

Treatment.—Hot fomentations, hot poultices, electricity, and other measures elsewhere recommended for neuralgia, are equally useful in these cases.

Miscarriage and Abortion.—These terms are applied to cases in which the fetus is discharged before the seventh month. Miscarriage occurs most frequently in fleshy persons and those who are subject to menorrhagia, or profuse menstruation. Nearly all the severe acute diseases may give rise to miscarriage. Violent excitement or exertion, either mental or physical, displacements of the uterus together with chronic inflammations and tumors of the organ, falls, and other violent accidents, severe vomiting or coughing, bad hygiene, and sexual indulgence, may be enumerated as the principal causes of abortion.

The symptoms of abortion within the first two weeks do not differ very greatly from those attending menorrhagia. Not infrequently miscarriages occur at this period without the woman being conscious of the fact. In the third or fourth month, there is considerable hemorrhage, and some portion of the fetus is likely to be retained in the womb, where decomposition not infrequently takes place, imperiling the patient's life. Criminal abortion is very frequently attended by fatal results. The moral aspect of this question has been fully considered elsewhere (page 355). Miscarriage occurring as late as five or six months, very closely resembles labor.

Treatment.—In cases in which abortion habitually occurs at a certain time, complete rest should be enjoined upon the patient. She should not be upon her feet at all until the dangerous period is past. Sexual excitement should also be strictly prohibited. In case flooding occurs, or other symptoms of abortion, the patient should at once go to bed and apply cold compresses over the bowels, and tepid injections of tannin or a decoction of white-oak bark into the vagina. Abortion or miscarriage is much more likely to be followed by diseases of the womb than natural labor, and hence every possible precaution should be taken to prevent exposure in these cases.

Premature Labor.—This term is applied to all cases of premature childbirth occurring after the beginning of the seventh month. The causes are essentially the same as those which produce abortion. The rules already laid down for the management of labor at full term, are equally applicable to premature labors. It should be remarked that extra preparations should be made, to give the feeble infant likely to be born in these cases, the best possible chances for life.

Death of the Fetus.—When many symptoms of pregnancy which have been distinctly present disappear, there are grounds for suspicion that death of the fetus has been occasioned by some cause. The causes which occasion death of the fetus are essentially the same as those which give rise to abortion and premature labor. The fetus is generally expelled a week or ten days after it dies.

Molar or False Pregnancy.—Two forms of false pregnancy occur. In one of these, after the usual symptoms of abortion, and with considerable pain and hemorrhage, a fleshy body of varying size is expelled, which may be shown by a close examination to be an undeveloped fetus. This form of false pregnancy is attended by little danger.

In the other form, the symptoms of pregnancy continue up to the fourth of fifth month, though no fetal movements are ever felt. The abdominal walls are generally distended more than at the same time in true pregnancy. After a time, a large quantity of bloody serum is discharged, along with severe hemorrhage, the escaping fluid containing small bladder-like bodies resembling grapes.

Flooding.— The patient should at once go to bed. Cold compresses should be applied over the lower part of the bowels. She should be given an abundance of cold water to drink. Cold water may also be injected into the rectum with advantage. In case of a severe hemorrhage, call a physician at once, and in the meantime apply to the mouth of the womb a sponge or mass of cotton previously boiled and then saturated with lemon juice or strong vinegar. Hold firmly against the womb until the physician comes. A strong hot solution of alum may also be used.

Puerperal Convulsions.— This is a very serious disease which may occur during or after labor. It generally occurs in patients who have suffered with disease of the kidneys during labor, as shown by swelling of the feet and limbs, puffiness of the face, and the presence of albumen in the urine. Among the first symptoms are disorders of vision, as blurred sight, double vision, etc. The attack generally begins with strong muscular contraction, in which the muscles of the limbs become rigid, and respiration ceases through rigidity of the muscles of the chest. This is followed in a short time by spasmodic twitching of the various muscles. Sometimes the contortions of patients suffering with this affection are frightful. The most common, and probably the sole, cause of true puerperal convulsions, is poisoning of the blood by the elements of the urine which are not eliminated on account of congestion or inflammation of the kidneys. Sometimes the attacks assume a character resembling that of epilepsy. These cases are probably due to some other cause.

Treatment.—The preventive treatment of this disease is by far the most important. It consists, first, in thorough attention to the laws of hygiene relating to the pregnant state. The diet should be chiefly fruit and farinaceous articles of food. Sugar and meat should be carefully discarded. As soon as the swelling of the feet and puffiness of the face are observed, the patient should take frequent warm baths with wet-sheet packs, vapor baths, and other treatment to induce active sweating. Large quantities of water should be daily drank,—in

fact, the general course laid down for Bright's disease of the kidneys should be carefully followed.

At the time of the attack, vigorous efforts should be made to relieve the system of the noxious elements by which the brain and nervous system is being poisoned, through the medium of perspiration. If possible, the patient should be given a hot blanket pack, hot bottles being packed around her to induce copious sweating. If the bowels are constipated they should be relieved by a warm enema. A spoon handle wrapped with cloth should be placed between the teeth to prevent the tongue being bitten. The patient should not be violently restrained, but should be gently prevented from injuring herself. When coma is present, as is frequently the case, cold or iced compresses should be applied to the head. Hot and cold applications should be made to the spine. If these measures do not bring relief, chloroform may be used to subdue the spasms. This remedy is generally effective. When the contortions have ceased, energetic measures should be taken to prevent their recurrence, by exciting activity of the kidneys and skin.

Puerperal Fever.—This disease is responsible for a large number of deaths following confinement, and a great multitude of chronic diseased conditions, by which women who have suffered from it are crippled and maimed, many times for life. It is now pretty generally conceded that severe fever following confinement is generally the result of absorption into the system of some of the products of the decomposition taking place in the generative passages. Having gained access to the blood, the disease germs multiply in great numbers, and soon pervade the whole system. In addition to the general fever, inflammations of the womb or its surrounding tissues and the ovary and other organs are very likely to occur, leaving adhesions, consolidations, abscesses, indurations, etc.

Treatment.—The best treatment of this disease is prevention. If the parts are thoroughly washed out two or three times a day with a disinfectant lotion, by means of a syphon syringe, the thorough cleansing being kept up continuously until the lochial discharge has entirely ceased, there is little chance for the germs of disease to find an entrance into the system, and puerperal fever will not be likely to occur. A physician attending one case of the disease will be very likely to convey it to other patients whom he may visit. The fever should be treated on the general principles laid down for the treatment of fever elsewhere. (See also "Antiseptic Midwifery," in Appendix.)

FEEDING AND CARE OF INFANTS.

The fact that fully one-third of the human family perish before the age of five years is sufficient apology for devoting a brief section to the consideration of this subject. Notwithstanding the immense number of physicians, nurses, and mothers who have had much experience in the rearing of children, the amount of accurate information on the subject of infant care and feeding possessed by the general public is very meager. We shall endeavor to summarize as precisely as possible the most reliable information to be gathered from experience and research on this subject.

INFANT DIET.

Carefully collected statistics show beyond room for reasonable doubt that the most active cause of infantile disease is improper feeding. This cause is particularly active during the warm season of the year, which occasions the immense number of deaths from various digestive disorders at this period. The careful observance of the following suggestions will rarely fail to secure immunity from disorders of the digestive organs:—

1. Milk is the natural and proper food for children from infancy to the age of twelve or eighteen months. Starchy foods cannot be digested, owing to the fact that the digestive element of the salivary secretion is not formed in sufficient quantity during the first few months of life to render the child able to digest farinaceous foods, such as potatoes, rice, fine-flour bread, and the like.

2. As a general rule, an infant should be fed once in two or three hours during the daytime and once at night until one month old. After this time it should not be fed at night, and it should take its food no more frequently than once in three hours during the daytime until four months of age. Between four and eight months, the intervals should be gradually prolonged to four hours. After this time the fourth meal should be gradually dropped off, so that at twelve months the child will take its food but three times a day.

3. If the child is deprived of its natural food, a healthy wet-nurse should if possible be secured,—at least until the child is two or three

months old. When a suitable wet-nurse cannot be secured, milk from a goat or cow constitutes the best food. Care should be taken in the selection of cow's milk, that being preferred which is obtained from a cow which has calved two or three months previously. The health and care of the cow, particularly the character of her food, are matters of importance which should receive attention, as there is no doubt that consumption is frequently communicated to infants from cows whose lungs have become diseased through confinement in close stalls with foul odors, and deficient and improper food. Cow's milk should be diluted at first to one-half, the proportion being gradually increased as the child's stomach is strong enough to bear it. Pure water, lime-water, barley-water, and thin well-boiled and strained oatmeal gruel, may be used to dilute the milk. The object of the dilution is, first, to render it more nearly like mother's milk in the proportion of nutriment which it contains, and second, to render it less liable to form hard curds in the stomach, which are very likely to occur when the milk is taken undiluted.

4. Cow's milk, or other fluid food, is best given to an infant with a proper nursing bottle. The best forms of nursing bottles are those which are furnished with rubber caps such as are shown in Figs. 350 and 351. The cap should be removed and well cleansed with boiling water in which soda or saleratus has been dissolved in proportion of a teaspoonful to a pint each time the bottle is used. Both the nursing bottle and the rubber nipple should be kept immersed in a weak solution of soda when not in use. They should also be scalded the second time just before the child is fed. Cow's or goat's milk should be boiled fifteen minutes before feeding, to destroy all germs. (See section, "Dangers in Milk.")

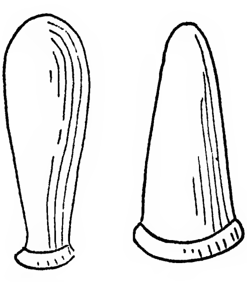


Fig. 350. Fig. 351.

5. The diet of the mother while nursing is of very great importance, as anything that disturbs the system of the mother will affect that of the nursing infant more or less. Her food should be nourishing, simple, and wholesome. Stimulants of all kinds, whether in the form of alcoholic drinks or irritable condiments, should be carefully avoided. Pastry, desserts, ice-cream and confectionery, and all similar articles, should be wholly avoided. Oatmeal porridge or milk

and the various whole-grain preparations, eggs, and, with those accustomed to its use, a moderate allowance of meat, together with an abundance of ripe fruits, constitute the best diet. With reference to increasing and diminishing the supply of milk by regulation of the diet, see paragraph on this subject elsewhere. Vegetables, such as cabbage, turnips, and carrots, together with peas, beans, and onions, which are very likely to produce colic in the child, should be carefully avoided.

6. Feeble infants, especially those who are born prematurely, will need to be fed a little more frequently than others, and will require extra care.

7. The interior of a child's mouth, as well as its lips, should be carefully wiped free from milk or other food after feeding, a moist cloth being used for the purpose.

CAUTIONS RESPECTING INFANT FEEDING.

1. Too frequent feeding is a very common practice, and is one of the most active causes of colic and various other forms of indigestion in children. Many mothers wonder why the children do not grow fleshy notwithstanding they have a voracious appetite and eat nearly all the time, when the simple reason is that the food taken is not digested and assimilated on account of the weakened and disordered state of the digestive organs. Frequent feeding at night is not only unnecessary, but exceedingly harmful. After the first month or two, infants require no food at night. If they are properly educated upon the matter of diet from the start, they can be managed without any difficulty.

In order to break children of the habit of eating in the night when the mothers have been in the habit of nursing them at all hours of the night as well as the daytime, a little warm water may be given in the nursing bottle instead of allowing food. This will often satisfy the child's cravings so that it will go to sleep.

2. Overfeeding is a much more frequent error than the opposite. Very frequently children are allowed to take too much at a time. This is the most common cause of vomiting in infants. Fortunately their stomachs are so constructed that the surplus of food may be easily expelled; but sometimes this is not the case, and often very serious disorders of digestion result. The child should be removed from

the breast when its hunger has been satisfied, and should not be urged to take more when it is evidently satisfied.

3. The child should never be allowed to sleep at the breast, or with a nursing bottle to its mouth.

4. The child should never be put to the breast to stop its crying. Children cry in consequence of disturbances of the stomach much more often than from hunger. The child will often nurse as though hungry when the stomach is already full of undigested food, being induced to do so by the pain or discomfort which it suffers. Children often cry in consequence of the irritation of pins, but no matter whether any other cause for crying should be found or not, the child should not be nursed except at its regular hours.

5. No other food but milk, except such fluids as are used to dilute cow's milk, should be used until after several teeth have made their appearance. As a general rule, bread and other farinaceous food cannot be digested before the age of seven or eight months. Meat should never be given to children until after they have acquired a sufficient number of teeth to masticate it thoroughly, and then should be allowed only in very small quantities once a day. Young children are very much better off without meat. Convulsions in children are often due to the use of meat.

6. Children should never be given sugar-teats, candies, sweetmeats cheese, nor pastry. The habit many nurses have of feeding an infant sugar and water every hour or two, during the first one or two days of its life, is a practice which cannot be condemned too strongly. The same may be said to be the cause of colic and other disturbances. Catnip tea and similar other decoctions used at this time, are exceedingly harmful, not only disturbing the stomach and giving the child discomfort, but preventing the natural desire for food and depriving the mother of the benefit to be derived from suckling the child. Placing the child early to the breast is one of the best means of preventing "gathered breast" and securing a plentiful supply of milk. The practice that many people have of taking young children to the table and feeding them bits of almost everything on the table cannot be too strongly discountenanced. It is one of the most prolific causes of digestive disturbances in children.

8. As a general rule, menstruation and pregnancy, either of which may occur during nursing, are likely to affect the child injuriously, and demand weaning. As a general rule, a woman should dis-ontinue

nursing upon the occurrence of conception or pregnancy. Three lives may be affected injuriously by a neglect of this rule.

9. Special care must be taken in the warm season of the year of children that have been weaned or that have been raised on the bottle, to avoid feeding sour milk or milk that has become slightly changed by standing. In very hot weather, milk sometimes begins to sour in a very short time. This is especially the case when milk pans or cans have not been cleansed as thoroughly as they should be. If either the mother or nurse in charge of an infant would obtain a "test paper," which can be found at any drug store, and always test the child's milk when there is any possibility of its being sour, many cases of illness and death would be prevented. The process of testing is a very simple one, it only being necessary to observe that when the milk is acid the blue paper will be turned red, and when it is sweet, no change will occur.

10. Another danger to which children are exposed is the use of milk which has been poisoned by standing in pans made of tin adulterated with lead. This danger is now becoming quite a serious one. Infants are more susceptible to injury than adults on account of their weakness and little vitality.

11. Many mothers have sacrificed their children by attempting to rear them upon the various patented baby foods sold in the stores. A majority of these foods are starchy preparations which contain little or no nourishment valuable for infants. Some of them, particularly the various preparations made according to the directions of the eminent German chemist, Prof. Liebig, are useful, but not more so than well boiled oatmeal or graham gruel with the addition of cow's milk. Directions for feeding infants whose digestive organs are very badly disordered, are considered in connection with the diseases in the treatment of which they are specially necessary.

12. Sexual excesses have a very damaging influence upon the nursing infant.

13. A nursing mother should never give way to fits of anger or depressing emotions of any sort, but endeavor to improve and sustain her general health in every possible way by proper diet, daily exercise in the open air, abundance of sleep, avoidance of overwork, etc.

Weaning.—Under this head it is important to call attention to the following points:—

1. The proper time for weaning a healthy infant is at about one year of age. Very weakly children sometimes require longer nursing. The custom practiced by some women of prolonging the nursing period to two years or more is injurious to both mother and child.

2. The process of weaning should be conducted gradually. At the age of eight or ten months the child may be fed bread and milk, or oatmeal porridge once a day, this article being substituted for mother's milk. As it grows older, the preparation of these articles of food may be increased, and some other articles, as perfectly ripe fruit, with now and then a portion of a baked potato, simple soups, etc., may be given. Graham bread should be invariably used in preference to fine flour bread. If necessary, the coarsest of the bran may be sifted out. By the adoption of this plan, at the end of twelve months nursing may be discontinued altogether without the child suffering any serious consequences.

From this time, the diet of the child should still consist chiefly of graham bread and milk, baked potatoes, ripe fruit, and equally simple articles of food. Meat, coarse vegetables, butter, tea and coffee, mustard, pepper and other condiments, pastry, preserves and sweets of all kinds, rich puddings and sauces, dessert, and all articles difficult of digestion, should never be given to young children; indeed, the world would be vastly better off if these articles were rarely if ever taken either by older children or adults. When the child is costive, oatmeal porridge as a principal article of diet is an excellent means of regulating the bowels. In making oatmeal porridge the milk should not be boiled, but should be added after the porridge is done.

3. As a general rule, children should not be weaned in hot weather, as slight changes in diet are often sufficient to produce serious disturbances at this season of the year.

GENERAL CARE OF INFANTS.

The Bowels and Bladder.—The first movement of the bowels of a newly born child is of a green color. After this, the discharges should be uniformly of a bright yellow color. If the bowels have a slight tendency to constipation, they should be thoroughly kneaded several times a day, especially while the child is taking its morning bath. The cold compress worn about the bowels is also an advantageous measure. Giving the child one or two tea-

spoonfuls of cold water half an hour before nursing is also a useful measure. Care should be taken that the bowels and bladder move properly; and if there is any interruption of the functions of these organs, proper measures for relief should be resorted to at once.

Clothing.—The legs, arms, and neck, as well as the trunk, should be thoroughly clad with a soft flannel gown, in addition to which a woolen bandage should be placed about the trunk. Care should be taken in placing the binder not to draw it too tight, as this is one of the most common causes of prolapsus of the rectum, a not infrequent condition in young children. The child should not be clothed too warmly, as debilitating perspirations may be induced. The temperature of the room should be kept at about 68° or 70°, and a proper degree of moisture should be supplied by keeping a vessel of water upon the stove, or keeping the water-pan of the furnace supplied with water. Too much clothing should not be worn upon the head nor about the neck, as these parts are thereby rendered unnaturally sensitive and more liable to cold.

Bathing.—The daily bath is of great advantage to children, and soon comes to be much enjoyed by them. As a general rule, there is no danger that the child will be weakened in the slightest degree by taking a tepid bath every morning before its breakfast. The temperature of the water employed should first be about that of the body, but it should be gradually lowered, so that after a few weeks it will not be over 80° to 90°. Many physicians recommend a still lower temperature. It may be said that the cooler the water employed the more thorough is the protection against taking cold. No fears whatever need be entertained that the child will contract a cold by taking a cool bath. The whole surface of the body should be thoroughly rubbed. It is also well to anoint the skin as often as every other day with some fine unguent, as olive or cocoanut oil, or vaseline. Fine castile soap should be used in the bath every day or two.

Sleeping.—A healthy child, during the first few weeks of its life, sleeps nearly five-sixths of the time. The infant should be taught to go quietly to sleep while lying in its crib, without rocking, petting, or carrying in the arms. If the child is taught correct habits at the start, it will give much less trouble than if humored and petted until it makes unnecessary demands. The face of a child should never be covered during sleep, as it needs an abundance of fresh air as well as older persons. As a general rule, it is better that the infant should not sleep in the

same bed with an older person, even its mother. In cold weather, when it needs additional warmth, one or two large bottles filled with warm water may be laid beside it. Its crib should be well padded upon the inside so as to protect the child from injury from the hard frame-work.

Exercise.—Although it is unnecessary that infants should be constantly carried about, and is injurious to them as well, it is important that young children should be taken up several times a day and carried about for a few moments. This is especially true in the case of very feeble children. If allowed to lie too long upon the back, congestion of the lungs may be occasioned. After an infant is a month old, it may be safely taken out in pleasant weather at any season of the year, provided it is properly protected. In cold weather it is better that the child should be carried in the arms instead of being drawn in a cart, as there will be less liability of its getting chilled. It should also be exposed to the sun daily, or as often as possible. Care should be taken to protect the infant's eyes from the glare of sunlight.

Nurses should use caution in carrying infants not to hold them always upon the same arm. The neglect of this rule sometimes results in deformity. Children should not be urged to walk too early, or before the limbs are sufficiently strong to support the body well. Bandy-legs, knock-knees, and other deformities are the result of inducing children to learn to walk too early. As a general rule, the child should not be urged to walk until it shows a manifest disposition to do so.

Teething.—During this troublesome period children require special care, as the digestive organs are more liable to become disordered than at any other time. The child is often fretful and restless; and if it escapes being treated for worms half a dozen times, although innocent of harboring any such vermin, it is unusually fortunate. Teething is generally held responsible for every disease which occurs during the period of cutting the teeth. It is probable, however, that the process of teething is really responsible but for a small part of what is charged to it. Lancing the gums is seldom called for. The tissue covering the teeth is not sufficiently tense to require cutting to allow them to protrude. In fact they do not tear their way out, but the tissue covering is gradually absorbed. About the only occasion for lancing the gums is the occurrence of infantile convulsions. Rubbing the teeth with very hard substances is also a questionable measure. All the rubbing required will generally be performed by the child itself with the finger or thumb.

DISEASES OF CHILDREN.

A large share of the diseases to which infants and young children are subject, arise from the ignorance of mothers and nurses respecting the hygiene of infancy, or how to feed, clothe, and care for human beings during the first years of their existence. If adults suffer for want of attention to the laws of health, infants suffer still more, not generally, however, so much through intent to neglect, as through ignorance of the requirements of the human system during the first years of life. Undoubtedly, a large share of the most serious constitutional diseases from which adults suffer have their foundation laid in infancy by various injurious practices, to which attention is more particularly called elsewhere in this volume.

The treatment of the diseases of infants has, until recently, been in a very unsatisfactory condition. Fortunately for these little ones, recent investigations, which have been conducted independently in all the principal civilized countries of the globe, have resulted in the development of many new features and principles, by the aid of which they may now receive as fair a chance for recovery from illness as their older relatives.

The treatment of the diseases of infancy is attended by difficulties much more serious in many respects than those met with in the treatment of adults. One of the first of these is the difficulty of obtaining a full account of the patient's symptoms. The little one is not able to tell how it feels, and the information must be almost wholly gathered from observation. Only the quick eye of the well-informed and anxious mother and nurse, or the intelligent physician, is able to detect the evidences of disease manifested in early life. Many of the most serious conditions are indicated by slight symptoms which might escape detection if not well understood.

The following facts respecting the deviations from the condition of health as seen in children, will be of great value in enabling the mother or nurse to detect the early evidences of disease, and so apply the necessary and appropriate treatment.

General Appearance.—A peculiar or unnatural attitude, flush or pallor of the face, white or livid color of the lips, unusual dryness of

the skin or excessive or irregular perspiration,—as of the head and forehead only,—a disturbed or painful expression, moaning, starting, muscular twitching, grinding of the teeth, strong working of the nostrils, staring, etc., are all symptoms which should arouse suspicion of disease.

Pulse.—In children under two years of age, the pulse ranges from ninety to one hundred and thirty beats per minute. After two years, it is rarely more than a hundred, though it may be as low as seventy. Any great deviation from these limits indicates disease. A pulse as low as forty or fifty in a young child is a grave symptom; for instance, if a child seems feverish and sick, and has a pulse of one hundred and twenty, it is very likely due to some indiscretion in diet. If the same symptoms are present with a pulse of forty or fifty, it is very probable that the child is suffering tubercular meningitis, a very fatal malady.

Respiration.—The number of respirations in a child varies from thirty to fifty per minute. About forty is the usual average under two years. The respiration in children over two years of age should be about eighteen during sleep, and from twenty to twenty-five while awake. In children under one year of age, respiration is generally forty to fifty a minute.

Expression of Countenance.—The upper portion of the face is affected chiefly in brain disease, which is indicated by a knitting of the brow, contracted forehead, and rolling, fixed, or staring eyes. In heart and lung affections, the middle portions of the face are affected, the symptoms being sharp, distended and working nostrils, a bluish circle around the mouth,and dark rings under the eyes. The lower portion of the face exhibits symptoms relating to the bowels. The cheeks are changed in color, being either pale or flushed. They may be sunken or puckered, the mouth, being drawn to one side. The lips are livid or pale, often giving the expression which the famous Sir W. Jenner describes as "a Voltaire-like look." Unnatural contraction or dilatation of the pupils is significant of nervous disorders.

Gestures.—The motions of a child are often very significant. In brain disease the child puts its hand to its head, pulls at its ear, rolls its head on the pillow, and beats the air.

In abdominal diseases, the legs are drawn up, the countenance is anxious, cheeks sunken, and the child picks at the bedclothes. When

distress for breath from disease of the respiratory organs, the child tears its throat or puts its hand in its mouth.

The Cry.—In pneumonia, or capillary bronchitis, the child's cry is labored and half suffocated, sounding as though coming from an adjacent room. In croup it is hoarse, with crowing respiration. In disease of the brain, especially water on the brain, or hydrocephalus, it is sharp, shrill, and solitary, while in marasmus, or wasting disease of the bowels, it is moaning and wailing. Long continued crying from which the child cannot be diverted, is due to either earache or hunger. A peevish cry, attended by a slight, dry cough, is indicative of inflammation of the lungs. A very loud, shrill cry produced by coughing or suddenly moving the child, is usually due to pleurisy.

A cry accompanied by writhing and wriggling when the bowels move, is due to intestinal disease. Moaning is particularly characteristic of disease of the stomach and bowels.

As a general rule, children shed no tears before they are three or four months old. Some authors consider that in children under seven years of age the shedding of tears is a favorable symptom, while the absence of tears is very unfavorable.

Posture.—When the child cannot breathe lying down, and shows a great desire to sit up, or to be held in an upright position, disease of the respiratory organs is indicated. If the child lies on the side, with the legs strongly drawn up, with the arms close to or on the chest, some serious brain affection is indicated.

The Eye.—Squinting occurring suddenly in acute disease, is a serious symptom, indicating irritation of the nervous system. It may occur in connection with convulsions, and is likely to remain after the child has recovered from the fit. When a child suffering from tubercular meningitis becomes cross-eyed, it will probably die. A very small pupil indicates congestion of the brain. Large pupils which do not respond to light, indicate some disease of the nervous system. Inequality of pupils, that is, one contracted and the other dilated, when occurring in connection with acute disease, is a very serious symptom. Inequality of pupils is sometimes produced by the irritation of worms in the intestines.

The Tongue.—A furred tongue covered with small particles of whitish curd, indicates dyspepsia and intestinal irritation. A white fur usually indicates fever, and yellow fur chronic derangement of

the stomach and liver. Brown fur is present in typhoid fever, or the typhoid condition. A red and dry tongue indicates inflammation of the mouth, stomach, and bowels. A strawberry tongue, when accompanied by fever and an eruption, indicates scarlatina. A glassy tongue is an indication of dyspepsia. The tongue of a young infant can be seen when it is crying, or, if it can not, it can be made to protrude the tongue by placing the finger on the lip.

Development.—The child should grow from six to seven inches the first year. From the fourth to the sixteenth year, about two inches should be annually added to the height. From the sixteenth to the seventeenth year, the average growth is one and a half inches. In the next three years, the usual addition to the height is about one inch each year. Retarded growth is indicative of disease of the bones, rickets, or scrofula. Most of the diseases of youth and childhood accelerate the growth, which gives rise to the idea that too rapid growing produces disease, which is exactly the opposite of the truth; the disease being the cause of too rapid growth.

The child should be able to run alone at the end of twelve months. When it begins to walk, attention should be given to the manner in which it uses its limbs. If it walks simply on the toe of one foot with a limping gait, and complains of pain in the knee whenever the limb is handled, it may be suspected that hip disease is beginning. The child does not usually raise its head till it is six or eight weeks old, and cannot sit upright until four or five months of age.

Careful attention should be given to the teeth. The first incisors, or front teeth, should appear by the seventh month; the first back teeth by the twelfth month; the eye teeth and stomach teeth at the end of a year and a half, and the second back teeth, or molars, at twenty months.

Attention should also be given to the gums, to ascertain whether they are hot, swollen, or tense, indicating the approaching eruption of the teeth.

The Bowels.—The bowel passages of the infant should be yellow in color, and at least three or four a day. The appearance of curds in the bowels indicates imperfect digestion, and if the difficulty is not corrected, will result in intestinal catarrh or inflammation.

General Symptoms.—The whole surface of the body should be carefully examined. In health, the skin should be mottled, flesh firm,

skin smooth and elastic, and not flabby. Any eruptions should be noticed; the anus, especially, should be carefully examined for soreness or eruptions. The arms and limbs should move freely. It should be remembered that chills seldom occur in young children; convulsions and delirium correspond to chills and headache in adults. Sleeplessness or disturbed sleep is a symptom which indicates some quite serious disturbance, as infants naturally sleep very soundly, and when healthy, spend eighteen to twenty hours out of the twenty-four in sleep. A restless, sleepless child will be badly nourished, and dwarfed in development.

The *fontanel* is the proper name for the so-called soft spot which is found upon the head of all young children. There are, in fact, two; one in the fore part of the head, and the other in the back part. The larger one, which is here referred to, is situated at the upper part of the forehead. It is familiar to all mothers. By observing the condition of this spot, much can be learned of the condition of the brain. As the bones have not yet joined over the small space, the soft tissues filling it rise and fall with the increase or decrease of blood in the brain. When the fontanel is very full, the brain is full of blood, and congested. When it is unnaturally depressed, it is in consequence of too little blood in the brain. The first condition exists in congestion of the brain, inflammation, or water on the brain. The second is found when the child is suffering from the effects of wasting disease. The fontanel constitutes an excellent means of distinguishing between true and false dropsy of the brain, being depressed in the latter disease, in consequence of the deficient blood supply to the brain, instead of being full and prominent as in true dropsy of the brain.

The temperature of the body is a very important symptom as a means of determining the amount of fever present. It can only be ascertained by means of a thermometer, with which every family ought to be supplied. The natural temperature is 98½°. In children, the temperature may fall slightly in the evening just before going to sleep, but a rise of temperature to 100° or upward indicates fever. The sudden rise of temperature to 104° or 105° indicates the onset of some severe fever like scarlet fever or pneumonia.

CONVULSIONS.

SYMPTOMS.—Spasmodic twitching of the muscles; unconsciousness; other symptoms too familiar to require description.

This is a very common disease in infancy. It is very likely to occur during teething, either when cutting the first or the second teeth. As a general rule, it is due to indigestion, especially to accumulation of gas in the bowels. It may often be caused by taking cold. When it occurs periodically, several days in succession, being followed by fever, it is due to ague, during which the convulsion takes the place of the chill. The convulsion in infants represents the chill in older people. Convulsions are very frequent in measles, scarlet fever, whooping-cough, and other diseases of childhood. When one convulsion follows another in rapid succession, some serious nervous disease is indicated, as dropsy of the brain. Convulsions occurring during the course of disease are more serious than if they occur at the beginning. They are most likely to occur in children having what is termed a nervous temperament. They are also frequent in rickety children. They are likely to occur in prostrating diseases, and are sometimes produced by an inactive state of the liver.

In what is termed "inward fits," the child lies as if asleep, only moving the eyelids, the muscles of the face twitching, and the countenance wearing what is termed "a sardonic smile." Inward fits are generally produced by flatulence, or gas in the bowels. When the hands and feet twitch, and the child lies with its eyes half closed, waking with a sudden start and the face flushed, it is threatened with general convulsions. A convulsion may last for a minute or two, or for one or two hours, at the end of which the child often falls asleep, lies in a stupor, or cries loudly, or slowly returns to consciousness. Sometimes the stupor becomes more intense, and death occurs. This is very rare, except in the convulsions which occur in whooping-cough and meningitis.

Treatment.—Plunge the child as quickly as possible into a hot bath, pouring cool water upon the head and chest. When the convulsion is the result of indigestion, the child should be made to vomit, if possible, by drinking warm water or half a glass of warm water into which a teaspoonful of salt or a little alum has been stirred. When constipation and flatulence are the cause, give an enema of soap-suds. When the fontanel is prominent or bulging, the cold applications to the head should be very vigorous; ice may be used. When there is considerable fever, cool sponging of the body should be employed, together with cold injections into the bowels. When the fontanel is depressed, showing lack of blood in the brain, the convulsions may

sometimes be relieved by inverting the child, that is, turning its head downward. This is often recommended indiscriminately for convulsions, which is a grave error, as it might produce a fatal result in convulsions produced by congestion. "Inward fits" are relieved by fomentations to the bowels, or giving the child a few teaspoonfuls of water containing a drop or two of peppermint essence.

INFANTILE TRISMUS—"NINE-DAY FITS."

The symptoms of this affection are similar to those of tetanus in adults. The mother notices that the child cries when it is placed to the breast, and is unable to nurse. The jaws are found to be fixed partly open. The infant is seized at intervals with violent convulsions, foaming at the mouth, thumbs drawn into the palm of the hand, jaws locked, face livid. The disease is generally fatal in from one to three days; death sometimes occurs within a few hours.

Causes.—A careful investigation of the cases of this disease in all parts of the civilized world have shown that the principal causes are impure air, filthiness, improper diet, the use of alcoholic liquors by the mother, and improper dressing of the cord. About one hundred years ago, according to Ellis, from whose excellent work we have drawn largely in our account of the symptoms of disease in infants, one-sixth of all the children born in the Dublin lying-in hospital died within two weeks of birth, nineteen out of twenty dying of this disease. When the ventilation and hygienic management of lying-in cases were improved, only thirty-seven deaths occurred out of nearly seventeen thousand births. Probably the direct cause of the disease is germs.

Treatment.—Continuous application of ice to the spine is undoubtedly the best remedy in this disease, but with the very best treatment many cases will be fatal.

TETANIE.

SYMPTOMS.—Thumbs drawn into the palms with fingers flexed over them; hands bent at wrist; toes contracted; feet extended; arms and legs rigid; muscles of the jaws and back not affected; often spasm of the glottis, causing croupy symptoms; attacks intermittent, attended by severe pain; spine not affected.

This disease in some respects resembles tetanus, but it is by no means so grave an affection. It is unattended by fever, and the contractions are not continuous, which distinguishes it from inflammation

of the brain. The principal cause of this disease is irritability of the nerve centers, induced by a nervous organization, and the irritation of indigestion. It is most apt to occur in the first three years of life.

Treatment.—The disease is rarely fatal, is almost always relieved by a long-continued warm bath. A hot blanket pack may be used instead of a warm bath, with advantage.

NIGHT TERRORS—NIGHTMARE.

***SYMPTOMS.**—Child wakes suddenly, screams, does not recognize its mother; sees very small animals, and is much agitated; sometimes has pleasing hallucinations; an abundance of pale colored urine is generally passed during the attack.*

This is a somewhat alarming, but by no means a serious, affection, although it may be a precursor of grave disease. It does not indicate the presence of disease of the brain. It is almost always due to disorder of digestion, resulting from late suppers, overeating, eating sweetmeats, candies, etc., the use of too much meat and of tea and coffee.

Much of the nervousness of children is due to the use of meat. In the majority of cases, children would be much better off if they had none at all before ten or twelve years of age, and we have seen very vigorous and healthy children of twelve and fourteen who have never tasted a particle. Nightmare is a mild form of this affection.

Treatment.—All the exciting causes just mentioned should be avoided. The child should have regular meals, not oftener than three times a day after two or three years of age; and should never take food within two or three hours of retiring. Food should be simple and unstimulating. All measures should also be adopted for improvement of the general health, as daily exercise in the open air, exposure to the sun, etc. Children who are old enough should be encouraged to take sufficient exercise to become somewhat fatigued, as sound, refreshing sleep will be secured by so doing. For immediate relief, give a hot bath, with cold to the head, an enema of soap-suds or warm water, an emetic when the stomach is loaded with undigested food, and fomentations to the bowels when distended by gas. A teaspoonful of powdered alum or mustard in half a glass of water will produce prompt emetic effects, if the child can be made to take it. If the child is suffering with night terrors, he should not be allowed to sleep alone, and should be allowed to have a light at night if he desires. He should never be scolded or punished, but should receive sympathy and encouragement.

Nightmare occurs very often in grown people as well as in children. The causes and general indications for treatment are essentially the same as stated above.

ACUTE HYDROCEPHALUS—TUBERCULAR MENINGITIS.

SYMPTOMS.—FIRST STAGE: *Irritability of disposition; headache, shown by the child often putting hand to head; drowsiness; after the child is old enough to walk, dragging of one leg; little or no appetite; vomiting; constipation; fever; disturbed sleep; bowel discharges pale and offensive; tongue moist, red at tip and edges, furred in center; pulse quick and irregular; eyes sensitive to light; child sleeps with eyes partly open, grinds its teeth, often wakes in alarm; slight cough; pinched, haggard expression; sighing; yawning.*

SECOND STAGE: *Increased irritability; child wants to be let alone; delirium at night; pulse unnaturally slow; stupor; countenance frowning; head hot and fontanel pulsating; increased stupor; convulsions, which may leave paralysis; pupils large and motionless; eyes staring and sunken; pulse small and rapid; clammy sweats; labored breathing; purging; just before death, cessation of pain, purging, and difficult breathing, with apparent improvement.*

This is a very insidious and deceptive disease. It begins very stealthily, and the second or third stage is frequently reached before the real nature of the affection is discovered. It is a very fatal malady. It generally occurs under five years of age. A symptom of some importance not mentioned above is the appearance of a reddish line remaining when the finger is drawn over the skin. This symptom is not a positive one, but should excite strong suspicion of the disease. In some cases, the patient dies very suddenly from a rapid accumulation of water in the brain, known as water-stroke. For these cases, there is no help. The symptoms differ more or less in all cases, ordinary cases continuing for from ten to twenty days.

Causes.—The principal causes are depression of the vital powers, improper diet, especially encouraging precocity. Children early inclined to remarkable manifestations of intelligence and mental power, are more subject to this disease than others. There is a strong suspicion that the use of meat by children is a cause of this disease, it being a well known fact that children are especially liable to infection from diseased food, and that flesh food is often infected.

Treatment.—The treatment should be, first, preventive, by avoidance of all known causes of disease in children whose temperament makes them subject to it. The disease is curable only in its first stage. The essential measure of treatment is the application of cold to the

head and warmth to the extremities. Compresses wrung out of ice-cold water, frozen compresses, ice-bags, and bags filled with iced water, are the best means of applying cold in these cases. The hair should be cut short so that the brain may be more thoroughly cooled. The patient should be kept in a dark and quiet room. The diet should be very plain, and no stimulants should be given. When one case of this kind has occurred in a family, especial pains should be taken to ward off the disease in the other children by proper precautionary measures.

CHRONIC HYDROCEPHALUS—WATER ON THE BRAIN.

SYMPTOMS.—Great enlargement of the cranium, face and lower part of the head remaining of natural size; cry harsh; rolling of eyes; squinting; legs doubled on the body and feet crossed, feet and hands cold.

This affection may exist before birth to a greater or less degree, or it may come on afterward, often appearing ten or twelve months after birth. The head continues to enlarge until in some cases it becomes

Fig. 352. **Fig. 353.** **Fig. 354.**

Side, Vertex, and Front View of Head of Hydrocephalus Child.

enormous in size, giving the child a very unnatural appearance. Figs. 352 to 354. The child suffers with frequent convulsions and increasing paralysis. Death generally occurs within a year or two, but the patient may linger for many years.

Causes.—The causes of chronic hydrocephalus operate chiefly through the mother. They are those agents which affect the nutrition of the mother.

Treatment.—Patients occasionally recover from this disease, but in the majority of cases no treatment is successful. Tapping the head has succeeded better than any other method of treatment, but it is, nevertheless, rarely successful. Bandaging the head by means of elastic bandages or straps of adhesive plaster has been practiced, but without any very encouraging results.

FALSE DROPSY OF THE BRAIN.

SYMPTOMS.—Child restless, peevish, feverish; sighing, moaning, screaming during sleep; a sharp cry upon being touched; bowels loose, discharges green and offensive; husky cough; eyes wandering; stupor; pulse and respiration feeble.

The principal cause and characteristic of this disease is debility from want of proper food or any other debilitating cause. There is no inflammation, although the symptoms closely resemble those of tubercular meningitis. A very common cause of the disease is leeching and blistering the head for inflammation of the brain, by which the opposite condition is produced. It frequently occurs in exhausting diseases, as cholera infantum, typhoid fever, long-continued indigestion, etc.

Treatment.—The opposite treatment is required in this disease from that necessary in inflammation of the brain. Cold, and other depressing agents, should be carefully avoided.

It is very important that the mistake should not be made of treating this disease for inflammation of the brain, as very opposite remedies are required. The best means of distinguishing between this disease and acute dropsy of the brain is the depression of the fontanel present in false dropsy, while the fontanel is bulging in the graver affection. Warmth should be applied to the body, and occasionally to the head. Hot baths to the extremities, however, are not indicated, as they would diminish the amount of blood in the brain, which is already too little. Rubbing the back of the neck with a sponge dipped in ice water, or a piece of ice inclosed in thin muslin, may be employed three or four times a day with advantage. The patient should be kept in a horizontal position, preferably with the head lower than the feet. One of the most important measures of treatment is proper diet. The child should be fed with beef tea, well boiled oatmeal gruel, egg beaten with milk, chicken broth, etc. In case the digestion is very feeble, and the debility great, the white of an egg dissolved in a glass of water may be used to advantage. In some cases, some improvement seems to take

place from the addition of a teaspoonful of malt to the egg and water. Food should be given in small quantities and at short intervals. As the strength is increased, the quantity of food and length of the intervals should be increased. In many cases, nutritive enemas may be employed with advantage. The offensive character of the discharges can generally be made to disappear by the addition of a little lime-water to the food. A teaspoonful of lime-water with a couple of teaspoonfuls of milk may be given with advantage each time the child eats.

PARALYSIS OF THE SOFT PALATE.

SYMPTOMS.—Nasal tone of voice; liquids enter the nose on attempting to swallow.

This affection occurs most frequently after severe cases of diphtheria, coming on generally as the patient is recovering from the disease. Other muscles in various parts of the body are also likely to be affected at the same time.

Treatment.—When this difficulty is the result of diphtheria, recovery usually takes place within a few weeks without treatment of any sort. Recovery is greatly facilitated, however, by the local application of faradic electricity. Applications may be made externally with sponges, and internally by means of electrodes adapted to the purpose. Gargling hot and cold water alternately is also of some advantage.

INFANTILE PARALYSIS.

SYMPTOMS.—Sudden paralysis of the muscles of one or more limbs, or of a single group of muscles; subsequent wasting of the affected muscles.

This disease is a form of inflammation of a certain portion of the spinal cord; and it often occurs during teething, frequently also during an attack of measles, scarlatina, or other acute disease. Sometimes only a single muscles is affected. The muscles of the leg are more likely to suffer than any other part of the body. After the paralysis occurs, rapid wasting of the muscle takes place. The limb does not entirely cease to grow, but its growth is greatly retarded. After a time, the affected muscles undergo fatty degeneration.

Treatment.—When fatty degeneration has occurred, little or no improvement can be obtained. The satisfactory treatment of infantile paralysis depends upon early attention to the disease. During the first few days after paralysis first occurs, ice should be applied to the

spine several hours each day, for the purpose of limiting the inflammation as much as possible. The patient should also be kept quiet.

After the inflammation is subdued, electricity should be applied to the affected muscles, together with massage. In severe cases, the faradic current will not cause contraction of the muscles and galvanism must be used first. Very strong currents are sometimes necessary. The current should be frequently interrupted by withdrawing and replacing one of the electrodes, as contraction occurs only at the beginning and breaking off of the current. In curable cases, contraction may be produced by the faradic current, after galvanism has been employed for some time, and it should be used when this stage is reached. Cases in which contraction cannot be produced by either form of electricity are doubtful. Besides the use of electricity, the affected muscles should be vigorously rubbed and kneaded daily, and should be exercised, by the Swedish movements, while the patient is requested to make efforts to use them. Alternate hot and cold sponging, applied daily, is also a valuable measure of treatment. For incurable cases, apparatus of various sorts have been devised, by means of which elastic bands in some degree supply the place of the affected muscles.

SPINA-BIFIDA—CLEFT SPINE.

This is a singular congenital defect in development, in which the spinal canal is not completely closed. It generally occurs in the lower part of the spine. In consequence of the defect referred to, the soft part becomes stretched. A cystic tumor is formed, the cavity of which connects with the spinal canal, and is filled with the fluid which always exists in small quantity in the spinal cord and brain. Pressure upon the tumor will generally cause convulsions, by the pressure upon the brain. As the sac enlarges, it gradually becomes thinner, and in many cases ruptures. Generally, however, the patient dies of inflammation of the brain.

The causes of this affection are not well understood, but are undoubtedly ante-natal influences of some sort. This condition is an almost hopeless one; but a few cases of recovery have been reported.

Treatment.—The most successful treatment has been the employment of continuous pressure, made by means of bands or adhesive straps, and withdrawal of the fluid by means of aspiration. In a few cases, a cure has taken place after the injection of iodine and other substances into the sac.

CONSUMPTIVE CONSTITUTION.

It is important to be able to detect the peculiarities which characterize a child with marked consumptive tendencies, so as to take such measures as may, possibly, ward off the disease. Sir William Jenner describes the appearance of a child with consumptive tendencies, as follows: "Thin skin, clear complexion, the surface veins distinct, eyes bright, pupils large, eyelashes long, hair silken, face oval, ends of the bones small, shafts thin, limbs straight." Dr. J. considers freckles a symptom of value. Children subject to tuberculosis are precocious. They cut their teeth early, and learn to run alone and talk before others. The chest is generally long and round. In some cases it is long and pigeon-breasted, a condition resulting from repeated attacks of catarrh, and bronchitis.

Treatment.—The most important means of combating and overcoming the consumptive tendency in a child, are proper diet and exercise. A child of consumptive parents should be submitted to the most careful regimen from the earliest infancy. If the mother is consumptive, the child should be weaned, and a healthy wet-nurse employed. Great care should be taken to follow carefully all the directions given elsewhere for the care of infants in health. These children should not be given candy and sweetmeats of any kind, and should not be allowed to take tea or coffee. At the proper time, graham and oatmeal preparations should be introduced into their dietary. But little meat should be employed. As a general rule, the less meat used by these patients the better. Flesh food, with the ptomaines and various poisons which it contains, tends to lessen the resistance of the body, and is sometimes the medium of infection.

RICKETS—RACHITIS.

***SYMPTOMS.**—At first, profuse perspiration, especially of the head; feverishness at night, with disposition to kick off the clothes; tenderness of the whole surface of the body; child dreads to be touched; excessive quantity of urine, with copious deposits; child has an old, careworn look; eyes unnaturally brilliant; soon head enlarges; long bones become curved and the joints enlarged, as seen in wrists and ankles; curvature of the spine; teeth slow in coming; abdomen large and tumid; head flattened on top; bad smelling bowel discharges; capricious appetite.*

In addition to the above long list of symptoms the child may suffer with a variety of others arising from bronchitis, acute or chronic pleurisy, enlargement of the spine and liver, hydrocephalus, convulsions,

diarrhea, and spasmodic croup. When no teeth appear before the ninth month, the child should be carefully examined, as there are grave grounds for suspicion of rickets. When improvement does not occur, all the symptoms given above increase until death takes place from exhaustion. When improvement does occur, under proper treatment or changed conditions, the enlarged joints become smaller, but the curvatures of the spine and limbs are not corrected. The muscles generally undergo changes which render them weak and feeble, so that the children are often unable to use them, although they may still retain considerable size. This difficulty can be but partly overcome in advanced cases.

Causes.—The chief causes of rickets are improper food, bad air, and a general lack of proper care. The use of food which does not contain a sufficient supply of phosphates and other organic elements, on the part of the mother, is one of the predisposing causes. This may affect the child not only before birth, but after birth, through nursing. The affection is to be attributed to the use of superfine flour bread, more than to any other one cause. In order to prevent its occurrence, expectant mothers should make free use of oatmeal, graham, and other whole-grain preparations. The same principle applies to the diet of children after they have been weaned. Little if any benefit can be expected from the use of phosphates as they are generally administered in medicine. Powdered malt, maltine, and Trommer's Extract of Malt are useful nutritive medicines, presenting the phosphates in a natural condition. Every possible measure should be employed to improve the general health of the patient, by means of daily sponge baths and friction to the whole surface of the body, out-door exercise, sun baths, etc. Particular attention should be given to keeping the stomach and bowels in good condition. Electricity is a valuable tonic agent, and may be used in all cases with good advantage.

CEPHALHÆMATOMA—BLOOD TUMOR OF THE SCALP.

Cephalhæmatoma is a swelling on the head, generally caused by the rupture of a blood-vessel beneath the scalp from pressure during labor. As a general rule, absorption takes place without any particular attention. There is generally left, after absorption, a hard ridge, marking the edges of the tumor, which will also disappear after a time.

PAIN IN THE BOWELS.

Pain in the bowels in young infants is indicated by moaning cries, pallor, peculiar drawing of the corners of the mouth, twitching of the face during sleep, sometimes supposed to be due to "angel whispers;" the abdomen is usually bloated; infant kicks and frequently passes wind. The principal cause is indigestion. If the feet are allowed to get cold, pain in the bowels will generally result. It is also occasioned by the irritation of worms. Infants often manifest great eagerness to nurse.

Treatment.—Regulate the diet carefully, apply fomentations to the bowels, and warmth to the feet. A drop or two of peppermint essence in a few teaspoonfuls of water, will generally relieve the pain from gas in the bowels. A hot enema will usually give perfect relief.

VOMITING.

Vomiting in infants is usually the result of overeating, or of eating too fast. It is frequently occasioned by sickness which results from rocking in the cradle or tossing in the arms, both bad practices. Acidity of the stomach also frequently occasions vomiting. In these cases, the curds thrown up are sometimes very large, especially when cows' milk is used without dilution.

Severe coughing generally induces vomiting in children. Sudden vomiting, in which the food is expelled from the stomach with a good deal of force, is characteristic of hydrocephalus, or dropsy of the brain. Vomiting from overeating is really nothing more than regurgitation of food from the over-full stomach, which takes place very easily on account of the shape and position of the stomach in infants, which differ from that in adults. Nurses generally consider easy vomiting a good symptom, and the opinion has good foundation in fact, since in children who do not vomit easily, overeating results in fermentation of the food, which is likely to be followed by catarrh of the stomach and bowels.

Treatment.—Vomiting will usually be checked by regulating the quantity and quality of food. If it comes from sour stomach, a little lime-water should be used after each meal, one or two teaspoonfuls being taken in double the quantity of milk. When the child seems to suffer considerable distress, hot fomentations or a hot water bottle should be applied over the stomach.

INFANTILE DYSPEPSIA.

***SYMPTOMS.**—Vomiting; constipation; diarrhea; green or clay-colored stools; bowel discharges sour or fetid; appearance of curds in the bowel discharges; loss of flesh; irritability; moaning cry; capricious appetite; feverishness; symptoms of worms.*

Disorders of digestion constitute a very large share of the causes of illness in children. A careful study of the causes of death among children shows that derangement of digestion of various kinds, either directly or indirectly, is the cause of by far the greater share of deaths occurring in the first years of life. Vomiting is the most common symptom of indigestion. When the matters vomited are very sour, the child is suffering with acidity of the stomach, which may be the result of overeating or of the use of sugar or starchy food. Green, offensive bowel discharges indicate decomposition of the contents of the intestines in consequence of imperfect digestion. The green discharges are generally preceded by discharges in which lumps of curd are seen, indicating that digestion is imperfectly performed. After awhile, an irritation of the intestinal canal arises from the contact of hard, undigested curds which should have been digested in the stomach, and the discharges become more offensive in character, and are likely to contain considerable mucus from catarrh of the bowels. Clay-colored stools indicate an inactive condition of the liver, or an obstruction of the bile ducts, probably in consequence of the extension of the intestinal catarrh into the bile ducts. When the stools continue greenish, sour, or fetid, sometimes the child shows marked symptoms of wasting, becoming thin and wrinkled,—the countenance wearing an old look,—weak, peevish, and restless. In many cases, convulsions come on in consequence of the weakened state of the child, in one of which the child dies. In other cases, the child dies from exhaustion. When vomiting is the principal symptom, the difficulty seems to increase until the little sufferer is unable to retain anything upon the stomach.

Causes.—The principal causes of derangement of the digestion in children are improper food, too frequent feeding, overfeeding, the use of nursing-bottles which have not been properly cleansed. For directions with reference to feeding, see section on "Feeding and Care of Infants." Mental excitement, as care, anxiety, and particularly anger on the part of the mother, is a frequent cause of indigestion in nursing infants. Menstruation, pregnancy, sexual excesses, also exert a pernicious influence upon the infant through the milk. The ill health of the mother

is a frequent cause of laying the foundation, during the nursing period, of constitutional weakness in the child, as well as occasioning immediate disorders of nutrition. The practice that many mothers indulge in, of feeding the child every time it cries, is a most pernicious one, but we will not dwell upon this point, as it has been fully considered elsewhere. Nursing-bottles, especially those with long tubes, are responsible annually for a large number of deaths among children. It is so difficult to keep bottles perfectly clean, as milk rapidly undergoes decomposition when warm, that probably the nursing-bottle is not free from danger in one case out of twenty in which it is used. A slight degree of sourness in a bottle or tube will communicate fermentation to the fresh milk taken by the child, so that the food will very soon sour and decompose in the stomach, producing all the results of indigestion or dyspepsia. The use of milk from unhealthy cows, from farrow cows, or that which has been allowed to slightly "change" before using, is very sure to disturb the sensitive digestive organs of the infant.

Treatment.—The child should be fed at regular intervals, the length of which should be determined by its age. It should be fed a proper quantity, and at proper times. The habit of feeding children as frequently during the night as during the day, is a mistaken and injurious one. (See section on "Feeding and Care of Infants.")

When the child shows symptoms of indigestion, careful inquiry should be made respecting the nature of its food, the manner of feeding, etc. If the cause is ascertained to be in the mother, either a healthy wet-nurse, whose child is about the same age as that of the patient, should be employed, or, when this cannot be done, as is often the case, cows' milk should be used. The milk should be taken as fresh as possible. It ought not to be more than six or eight hours old, when fresher can be obtained. Attention should also be given to the length of time since the cow has calved. The milk of cows, being richer in caseine and in fat than human milk, should be diluted with pure water, or, as we prefer, with barley water or thin oatmeal gruel, well boiled, and strained through a coarse cloth. For a very young child, milk should be diluted one-half. As a child grows older and its digestive powers increase in strength, the quantity of water may be diminished.

In cases in which there is much acidity, and the discharges from the bowels are very fetid in character, lime-water may often be used

with advantage, one part lime-water being added to three or four parts of milk. In some cases it is sufficient to give the infant one or two teaspoonfuls of lime-water in double the quantity of milk after other food has been taken. In severe cases in which the digestive organs of the child seem to be unable to digest milk in any form, strong beef tea, white of egg dissolved in water, barley-water, or thin oatmeal gruel may be employed, either separately or combined. We have succeeded in cases which seemed utterly hopeless, in restoring children by beginning with egg water, made by dissolving the white of an egg in a glass of tepid water, and gradually adding a little milk, oatmeal gruel, beef tea, or other food, as the child became able to bear it. In many cases, it is necessary to give food in very small quantities, sometimes not more than a tablespoonful or two at a time, and at intervals of an hour or two. When there is evidence that the nursing-bottle is at fault, and the evidence may be considered good whenever the nursing-bottle is employed, the bottle should be discarded at once, and the child should be fed with a spoon. Nursing-bottles with long tubes should be avoided as in the highest degree dangerous. We have never yet found one which was not in a condition unfit for use. In extreme cases, in which the stomach rejects food altogether, it should be allowed to rest for a time, the child being nourished in the meantime by means of nutritive enemata of beef tea, eggs, milk, malt, and other preparations suitable for such use. In some cases, milk must be avoided.

Diarrhea, dysentery, colic, and other diseases of the digestive organs in children, should be treated upon the same principles, and essentially in the same manner, as recommended for these diseases in older persons.

WORMS.

Many children are rendered dyspeptic, and not infrequently made very ill, by constant treatment for worms. In the great majority of cases the symptoms which are supposed to be those of worms are really nothing more than symptoms which will only be aggravated by the use of the various worm medicines generally employed in such cases. When there is any suspicion that the child is troubled with worms, the bowel discharges should be carefully examined daily, for several days in succession. If no worms or segments of worms are found in the stools, it may safely be concluded that the symptoms observed arise from some other cause. At any rate, a physician should be consulted before any active measures of treatment are adopted.

We are sorry to say that many physicians are in the habit of adopting the suggestions of mothers and nurses, and consenting to treat infant patients for worms without sufficient grounds for so doing. Much harm is often done in this way.

SKIN ERUPTIONS.

Slight eruptions of the skin are very common in children. A form of eruption known as strophulus which appears in two forms, red and white gum, is most peculiar to small children. This eruption affects chiefly the face and arms, other portions of the body being occasionally affected. The eruption consists in little elevations about the size of a pin-head, which, when red, are known as red-gum, and when white, are called white-gum. Nettle-rash, an eruption which resembles the result of a nettle sting, is also one of the most common skin eruptions in children. The principal cause of eruptions of this character is indigestion.

Treatment.—Remove the cause by improving the child's digestion. Bathe the affected parts with a solution of bi-carbonate of soda, a teaspoonful to a pint of water. This generally relieves the intense burning. In severe cases, the parts affected may be covered with cloths wrung out of the solution.

ACCIDENTS AND EMERGENCIES.

SUDDEN ILLNESS.

In many cases of sudden illness, it is often of vital importance to know just what should be done at once, as prompt measures will often prevent serious consequences which otherwise might follow.

Fainting.—Fainting, or syncope, is due to sudden failure of the heart's action. At the moment a person faints, the heart nearly or quite ceases to beat, so that a sufficient amount of blood is not sent to the brain, and the person falls unconscious. The action of the lungs is also checked. Fainting may be occasioned by loss of blood, by violent mental emotion,—as joy, fear, or grief,—a blow upon the pit of the stomach, a violent electric shock, or anything which arrests the action of the heart. Many persons will faint at the sight of disagreeable or unusual objects. The sight of blood or a serious wound causes some people to faint. When a person faints, the face is pale, pupils dilated, breathing suspended or gasping, pulse very feeble or not perceptible. Just before fainting occurs, the patient is dizzy and becomes weak and limp.

Treatment.—Although fainting is a condition which approaches very near actual death, it is not often fatal. When a person faints he should be immediately laid on his back with the head lower than the rest of the body if possible, so as to encourage the flow of blood to the brain. The dress should be loosened about the neck and chest, and cold water should be dashed upon the face with the hand. Slapping the chest, especially over the region of the heart, is also a useful measure. If necessary, a handkerchief upon which a few drops of spirits of hartshorn have been sprinkled, should be placed to the nostrils of the patient. He should be kept in a horizontal position until the breathing and pulse are fully restored and color returns to the cheeks. The upright position is an exceedingly dangerous one for the fainting person. When the attack is prolonged, or shows a disposition to recur, alternate hot and

cold applications should be made to the spine and the patient should be given hot drinks of some kind.

Convulsions.—If coming on soon after eating, give a warm water emetic, or, if possible, wash out the stomach by means of a stomach-tube. Call a physician. If the extremities are cold, warm them. If the whole body is cold, give a hot bath. If the head is hot, apply ice. If there is violent jerking and clinching of the teeth, endangering the tongue, place between the teeth a cork or a piece of wood, or the handle of a spoon wound with cloth. If the patient does not recover quickly, send for a physician.

Apoplexy.—When a patient falls suddenly, becoming unconscious, with flushed face and full pulse, elevate the head and shoulders, and apply ice to the head. A physician should be sent for at once. For further treatment, see page 1078.

Sun-stroke.—For the treatment of sun-stroke, see page 1086.

Vertigo.—When a person is suddenly seized with vertigo or dizziness, he should lie down at once. If it occurs in a position in which there is danger from falling, as in looking over the edge of a precipice, looking down from a tower, and similar situations, the individual should at once withdraw to a sufficient distance from the point of danger to secure safety, and should lie or sit down and close the eyes until the symptom disappears. If a person feels dizzy in climbing, he should look up.

Sudden Mania.—Although violent mental derangement is generally preceded by symptoms of a premonitory character, it sometimes occurs very suddenly, making it necessary to take prompt measures. Mania may occur in consequence of disease of the brain or some temporary disorder of which delirium is a symptom,—as fever, delirium tremens, etc. As soon as signs of mental derangement occur, the patient should be put under careful watch. If the head is hot and the pulse full, relief will generally be obtained by the application of ice to the head. Most cases also require hot applications to the extremities at the same time. A physician should be called at once, and if there are evidences of real disease of the brain, the patient should be put under careful medical treatment, with proper supervision, or sent to an insane asylum.

Shock.—This term is applied to the condition which usually follows severe injury of any sort. It also frequently follows severe surgical operations. The patient generally becomes cold and complains of faintness. There is general tremor, pulse is small, speech and thought are

confused, there is little or no appetite, perhaps nausea and vomiting, and there may be involuntary discharges from the bladder and bowels. A shock is generally followed by reaction, in which the patient has more or less fever according to the intensity of the shock.

Hot bricks or bottles should be applied about the patient. If the injured part is painful, it should be soothed by hot applications. The hands and feet, and the whole surface of the body, should be rubbed until warm. Hot drinks of some kind should be given. Great harm may be done by the free use of stimulants, as is quite customary in these cases. By their employment the reaction, or fever, which follows may be greatly increased.

Hemorrhage.—The principal means to be employed for arresting hemorrhage are, pressure, ice or cold water, hot water, and the ligature. The means to be employed differ somewhat according to the part in which the hemorrhage occurs. As a general rule, the bleeding part should be elevated, and pressure applied at the point of injury. Hot or cold applications should also be made. Pressure acts by closing the bleeding vessels and allowing the blood to coagulate. Cold at first causes the blood-vessels to contract; but if applied continuously for a long time, the blood-vessels are paralyzed and become relaxed. Hot applications cause more permanent contraction of the vessels than cold.

The ligature is applied by a surgeon to the bleeding vessel itself; but when used by a person not skilled in surgery, should be applied either above or below the injury if it occurs in a limb, according as the bleeding comes from an artery or a vein. If an artery is wounded, the blood will flow in jets and will be of a bright red color. If the wounded vessel is a vein, the blood will be dark in color and will flow in a steady stream. If the vessel is an artery, the ligature or pressure should be applied between the wound and the heart; if a vein, it should be applied upon the opposite side. A slight hemorrhage from a wound may generally be very easily controlled by pressure upon the injured part with the fingers or a compress of folded linen. The old practice of applying plaster-of-Paris, earth, and other dry substances for relief of hemorrhage in the case of superficial injury, must be condemned. It gives rise to suppuration. Nothing but an antiseptic dressing should be applied to a raw surface. Treated in this way, suppuration is often prevented. (See Appendix for method of preparing antiseptic dressings.) A pad made of antiseptic dressing, drawn tightly over a bleeding surface, may be left several days without injury, if the pressure is not so great as to cause pain.

Bleeding from the Nose may generally be checked by holding the head erect, snuffing cold water up the nostrils, and holding the arms as high as possible. Other remedies are mentioned on page 988. Severe hemorrhage occurring from the trunk of the body must generally be controlled by pressure with the finger until the services of a surgeon can be secured.

Hemorrhage from a Cut Throat may be slight or severe, according to the size of the vessel cut. When the large arteries are cut, death may occur in a few minutes. The head should be elevated, and cold applied until a surgeon can be called. When the hemorrhage is severe, pressure with the fingers may be required.

Hemorrhage from the Arm or Leg may be controlled by pressure upon the principal artery of the limb, made as follows: Tie a knot in the center of a handkerchief or strip of cloth, of sufficient length to reach around the limb, including in the knot a small stone, a large marble, or in the absence of anything better, a small potato or other hard substance. Tie the bandage around the limb in such a way that the knot will come just over the course of the wounded vessel as shown in figure 355. It should be noticed that most of the large arteries run along the inside of the limbs. After tying the bandage, pass underneath it, on the side opposite the knot, a stout roller or rod. By means of this, the bandage should be twisted so as to tighten it, thus compressing the artery. Compression should be gradually increased until the hemorrhage is controlled. A bandage of this kind should not be retained in place too long, as the parts beneath it and below may be injured. Properly, its object is to control the hemorrhage until the bleeding vessel can be secured and tied by a surgeon or other competent person.

Fig. 355. Compression of Artery of the Arm.

An injury occurring in the upper part of the arm may be controlled by pressure above the collar bone of the same side, made by means of the thumb, or better, the ring of a key. See Fig. 356.

Fig. 356. Compressing the Artery of the Arm.

Hemorrhage from the Palm of the Hand is sometimes very troublesome. It can generally be relieved by pressure. If the bleeding is not checked by elevation of the limb, a proper pad should be applied over the wound and firmly secured in place by means of a bandage, and the hand should also be bound fast to a splint placed upon the back side of the arm. The two arteries at the wrist may be compressed by applying over each a piece of rubber tubing, or in the absence of anything better, pieces of a lead pencil an inch or two in length. It should be secured in place by a rubber bandage firmly applied.

Bleeding from the Gums, from the extraction of teeth, will be best relieved by very hot or very cold water.

In severe Hemorrhage from the Hand or Fingers, the arm should be tightly bandaged. It is also well to have the hand elevated to the opposite shoulder and held in place by a properly adjusted sling.

Hemorrhage from the Arm below the Elbow, or the Leg below the Knee, may be greatly lessened, and sometimes entirely checked, by bending the limb upon itself as strongly as possible.

Hemorrhage from the Stomach, indicated by vomiting of blood, requires perfect rest, the application of ice over the stomach, and swallowing small bits of ice in rapid succession.

Hemorrhage from the Lungs requires heat at the extremities; restraint from coughing; the application of cold to the chest; ice pills; and the inhalation of an atomized solution of tannin, or the vapor of turpentine. See page 1011.

Hemorrhage from the Bowels generally results from hemorrhoids, or piles. Cold water should be injected into the rectum, and the patient should be kept quiet in a horizontal position. See page 914.

Bleeding from a Rupture of Varicose Veins in the lower limbs is sometimes very severe. It may be relieved by the application of a tight ligature both above and below the point of rupture.

WOUNDS.

Wounds are generally divided into the following classes: Incised wounds, or cuts usually made with cutting instruments or with glass; lacerated, or torn wounds; contused, or bruised wounds; punctured, or penetrating wounds, and poisonous wounds. Wounds require different treatment, according to their character. Cuts generally heal up quite readily, if properly dressed soon after the wound is inflicted. After the hemorrhage has been stopped, the wound should be carefully washed with boiled water, or better, with an antiseptic solution (see Appendix, "Antiseptic Dressings"). When the wound is thoroughly cleansed of blood and all foreign matters, the edges should be brought together and held in position by means of stitches, adhesive plaster, or bandages, or all combined. Silk, silver or iron wire, catgut, and horse-hair are the most suitable materials for sutures. If stitches are employed, they should be removed after three or four days, or as soon as the parts have become united. If retained too long, they are a source of irritation. If adhesive plasters are used, narrow strips should be employed, so in case there should be any discharge, there will be an opportunity for it to escape between the strips. When the cut is a long one, adhesive strips will generally require to be reinforced by a bandage. Simple water-dressing, or cloths wet in a solution of carbolic acid, five or ten drops to the ounce, constitute the best dressing for most wounds.

If the end of the finger or toe has been cut off by a sharp instrument, it should be at once replaced, even though it may have been entirely severed. We have known several instances in which the portion replaced in this manner has grown fast. If the severed part is frozen or badly bruised, an attempt to secure union will of course be useless.

Punctured Wounds.—Punctured wounds, when inflicted with a clean, sharp instrument, generally heal quite readily. When the

wound is made by a rough, blunt, dirty, or rusty instrument, healing occurs much more slowly, violent inflammation sometimes being produced. In cases in which a nerve is injured, but not completely severed, as in a punctured wound produced by stepping upon a rusty nail, lockjaw is likely to occur; hence, wounds of this character should receive prompt attention.

Punctured wounds quite often heal quickly at the surface, while union does not take place in the deeper tissues. This gives rise to the formation of an abscess, making it necessary to force an outlet by opening the wound with a penknife or lancet. When the wound is made by a thorn or splinter, the foreign body should be removed by means of a pair of tweezers. It is useless to pick at the splinter with a needle, as it will be likely either to be driven farther in or to be broken off. When a fish-hook is caught in the flesh, if it is imbedded beyond the barb, no attempt should be made to withdraw it, but the point should be pushed forward until it emerges from the skin, when it may be cut off by means of a file or pair of pliers, and the balance of the hook withdrawn, or the line may be detached and the whole hook pushed through the tissues. If a crochet hook has been thrust into the flesh, a not uncommon accident, the attempt should not be made to withdraw it directly, but a large knitting or darning needle should be introduced along side of it and placed against the hook, when both may be drawn out together without inflicting further injury.

Not infrequently punctured wounds are made by needles which may either be broken off in the tissues or entirely imbedded. In these cases the parts should be kept perfectly still, as the movements of the muscles of the part may bury it in deeper. If the needle cannot be readily got out, it may be left without any very great danger of doing harm, as it will probably work out of itself. Punctured wounds should be treated by means of hot fomentations or poultices, or compresses of tepid water or carbolic acid lotion.

Torn and Contused Wounds.—These wounds heal much more slowly, as a general rule, than either incised or punctured wounds, never uniting by what is termed *dry* or *primary union,* in which no pus is formed, the parts adhering together at once, leaving no scar. These wounds heal by a process known as *granulation,* or secondary union, which is accompanied by more or less profuse discharge of pus. When the granulations which are formed in the process of healing grow so rapidly as to fill up the wound and aperture above the sur-

rounding tissues, we have what is known as *proud flesh.* The new skin destined to cover the wound is gradually formed about the outer edge, extending inward until the whole is covered. The new tissue formed by this process of healing contracts after the healing process is complete, and forms what is known as scar or cicatricial tissue. Scar tissue becomes after a time like the tissue in which it is produced.

Still another method of healing which is sometimes illustrated in this class of wounds, as well as others, is that known as *scabbing.* This is a process by which the repair of the injured part takes place very rapidly in a manner similar to that seen in primary union. No granulations are formed, but a protective substance is thrown out which when dry forms what is known as scab, beneath which the repair of the injured parts takes place. Artificial scabs may be formed in a clean fresh wound by moistening a bit of lint in fresh blood and placing it over the injured part.

The wound should be cleansed antiseptically, and the injured parts should be drawn together by means of plasters and bandages. Care should be taken not to employ too strong compression. Either water-dressing or lint saturated with sweet oil containing ten drops of carbolic acid to the ounce, may be employed. If the parts have been badly bruised, hot fomentations should be applied. Heat is especially essential in cases in which considerable portions of tissue have been nearly severed from the body, but have retained a sufficient amount of attachment to justify the attempt to secure union.

For contused wounds, carbolated vaseline, containing ten drops of carbolic acid to the ounce, constitutes an excellent dressing. It should be spread upon a piece of thin cloth and then applied to the injured parts.

If considerable sloughing occurs through the death of the tissues, the parts should be thoroughly cleansed two or three times a day with fine castile soap and water, followed by a one per cent solution of carbolic acid. Portions of the limbs are sometimes so badly torn and mangled that healing cannot take place. In this case the injured part must be removed by amputation. It should be borne in mind, however, that nature's resources are often much greater than might be considered possible, parts apparently irreparably injured being restored to a very useful condition. Hence, when there is even the barest possibility of saving the injured part, amputation should not be performed. We have known instances in which individuals have resisted the advice

of the surgeon who urged amputation, and have recovered with useful arms and legs, who otherwise would have been maimed for life. Recovery is especially likely to occur from severe injuries of the hands and feet.

Dr. Frank Hamilton, of Bellevue Hospital, New York City, has secured some remarkable results in these cases by continuous immersion of the injured part in warm or hot water, the temperature being maintained at 100° or a little above. When there is a marked disposition of the injured parts to become gangrenous or to slough, hot fomentations should be applied, or the parts should be immersed in water as hot as can be borne. Some surgeons have ridiculed this process of "maceration," as they are pleased to term it, but Dr. Hamilton has so thoroughly demonstrated its utility that it is now recognized as one of the most useful means of treating badly lacerated limbs. It is of course necessary that the water should be changed frequently; three or four times a day is none too often.

Dissection Wounds.—The tissues and fluids of animals become very poisonous after decomposition has begun, and are sometimes extremely poisonous in character independent of decomposition, on account of disease—as in the case of death from malignant pustule, glanders, etc.

Medical students, physicians, butchers, veterinary surgeons, and hunters, are the most likely to suffer from wounds of this character. It is said that some barbarous tribes render their arrows and spear points poisonous by smearing them with the fluids of decomposing flesh. It is also claimed by eminent authorities that poisons of this character may be carried by the flesh-fly. The local symptoms of a wound of this character are those of a very painful boil.

The hands should never be exposed in dissecting a decomposing body, especially if any portion of the skin is injured by a scratch or other excoriation. "Hang-nails," or "ag-nails," on the fingers, are frequently means of inoculation in dissection. Touching all suspicious points with nitrate of silver or lunar caustic and smearing the hands with oil or vaseline, are excellent preventive measures. If an abraded surface has been accidentally exposed or a wound inflicted with an infected instrument, the parts should be at once touched with nitrate of silver or pure carbolic acid. When the first symptoms of a poisoned wound appear, as mentioned before, the part should be freely opened, and nitric acid, pure carbolic acid, or a white hot iron should be applied. A large

nail or three-cornered file heated to a white heat and applied to the diseased part is a less painful remedy than the application of caustics. If the iron is only heated to a red heat, however, the pain is very great.

Bites of Animals.—Dogs, cats, horses, hogs, rats, squirrels, and polecats frequently inflict bites upon human beings. When these animals are not suffering from rabies these bites generally heal quite readily, though much laceration may result in continued and violent inflammation. If the animal is in a state of rage at the time the bite is inflicted, the wound is likely to assume some of the characteristics of a poisoned wound. We have met several instances in which wounds inflicted by the bite of human beings gave rise to very serious inflammation. In one instance, a surgeon on probing a wound which was inflicted upon the hand, made a diagnosis of dead bone. After making an incision, what was supposed to be a dead bone was removed, which upon examination proved to be an incisor tooth of the individual by whom the bite was made.

Whenever there is the slightest ground for suspicion respecting the condition of the animal inflicting the bite, it should be treated as a poisoned wound, both immediately after the bite is inflicted and subsequently.

Hydrophobia—Rabies.—The symptoms of this disease are itching, burning, smarting, numbness of the part bitten, slight shivering, restlessness, no appetite for food, headache, frightful dreams, distress occasioned by the sight of water or any bright substance, spasm of the throat and shivering on attempting to drink, heat and contraction in the throat, great thirst, spasms of the whole muscular system, secretion of great quantities of viscid saliva, hoarseness, some fever, difficulty in breathing, great debility, death from exhaustion in two to six days. Cases are recorded, however, in which individuals have lingered a longer time, though in a state of such intense suffering that death would have been a grateful release at any moment.

This disease seems to have increased rapidly in modern times. This is probably due to the increasing number of dogs which are kept and allowed to run at large. The disease may be produced by the bite of a dog, wolf, polecat, or any other animal suffering with the disease. The period of incubation varies from a few days to a number of years. Cases have occurred in which the disease made its appearance ten or twelve years after the patient was bitten. The disease does not occur more frequently in hot weather, or the season known as "dog days,"

than at other seasons of the year, as is generally supposed. Statistics show that cases are fully as frequent in cold weather as in the summer season. It is probable that the disease may be developed spontaneously in the dog, but the most common way is by contagion through a bite. Human beings almost always contract the disease through the bite of a rabid dog; but experiments which have been made seem to show quite clearly that the saliva of a person suffering with hydrophobia will communicate the disease as well as the saliva of a mad dog or any other rabid animal. Fortunately but a small proportion of those who are bitten by rabid dogs are inoculated with the poison. No more than one person in twenty-five suffers. It is necessary that the saliva should be introduced into the blood. This can only be done through abrasion of the skin. Cases have been reported in which horses have been inoculated by eating straw upon which a mad dog has lain. Another case is cited in which a man died of hydrophobia, having contracted the disease by using his teeth in untying a knot in a rope with which a mad dog had been tied.

It is probable that in some cases all the symptoms of hydrophobia may occur wholly through fear and without the individual having been infected. This is of course most likely to occur in persons who have been bitten.

Treatment.—Owing to the almost hopeless character of this affection, prevention of the disease is of the utmost importance. This can be effected only by the enforcement of stringent laws against keeping all dogs. The practice of raising dogs as pets is really a reprehensible one. Cases are known in which persons have contracted hydrophobia through the licking of the hand by a dog afterward shown to be mad. There is a popular belief that certain species of dogs, particularly the variety known as the Spitz, are especially liable to this affection. A gentleman said to us not long ago that he would as soon have a rattlesnake in his house as a Spitz dog.

About the only treatment which is at all effectual is that which can be administered immediately after the bite. A strong ligature should be applied between the part bitten and the heart. It should be drawn sufficiently tight to obstruct the circulation. The bitten part should then be cut out, including a little of the sound flesh about it. An iron, as a poker, may be heated to a white heat and applied to the part instead of using a knife. Nitrate of silver or lunar caustic may also be

used for the same purpose, the part being first dried before it is applied. Probably the safest way is, first to wash and dry the part, and then apply lunar caustic or caustic potash. When caustic potash is used, it may be neutralized by washing the part with vinegar after a sufficiently energetic action has been obtained.

Whether treated in this manner or not, the wound itself generally heals kindly at first, but as already pointed out, is likely to become sore and irritable at some subsequent time just before the other symptoms of the disease make their appearance. It is unsafe to employ the mouth in sucking the poison from the wound, as has often been recommended, as infection may take place through some slight abrasion in the mucous membrane, which may be so small as to escape the attention of the individual.

A person who has been bitten should adopt the measures recommended instantaneously, if possible, and should then look forward to the future with hopefulness, consoling himself with the fact that a very small proportion of those who are bitten are actually poisoned, and still further with the thought that if inoculation has taken place, it has undoubtedly been rendered inert by the prompt treatment applied. Several thousand cases are recorded in which persons who have been bitten have had the bite treated in this manner, and in no case did hydrophobia subsequently appear. The pain attending the removal of the bitten part by a knife may be prevented by freezing the tissues with ice and salt mixed together in a thin muslin bag and held over the part foui or five minutes.

When the characteristic symptoms of the disease are fully developed, very little can be done, except to palliate the patient's sufferings. The vapor bath and the inhalation of oxygen gas are more highly recommended than any other measures of treatment. A physician practicing in India claims to have obtained success by cutting out the scar as soon as an attack is threatened by pain, tenderness, or other peculiar symptoms, thus dividing the nerves which are connected with it, and then inducing free perspiration by the hot water or vapor bath. A few years ago, Pasteur made the remarkable discovery that it is possible to render a person immune against rabies, or incapable of contracting hydrophobia. This is accomplished by injecting into the patient's tissues, weakened solutions of the hydrophobia poison, gradually increasing the strength of the solutions until the strongest poison may be used without effect. It was also found possible to

establish immunity after a person has been bitten, providing the treatment is begun within a few days. Pasteur institutes are now established in New York and Chicago.

Snake Bites.—Fortunately venomous snakes are much less common in this country than in many others, especially the tropical portions of the globe. The most common of the poisonous snakes which are found in this country are the *rattlesnake,* the *chickensnake, water moccasin,* or *cotton-mouth,* and the *copperhead,* all of which are about equally poisonous. The bite of the rattlesnake is inflicted by means of two fangs which are used only when the snake is irritated. At the same instant that the fangs are inserted by a striking movement upon the part of the snake, the poison is injected through a little canal which runs along the side of the fang. Not every person who is bitten is poisoned, as if the snake bites through clothing, the poison may be absorbed by the clothing, or the fangs may not penetrate the skin sufficiently far to inject the poison into the circulation.

The first symptoms which occur after a person has been bitten, are vomiting, coldness, lividity or yellowness of the skin, nosebleed, weak and irregular pulse, fainting, and perhaps convulsions and delirium. The bitten part swells rapidly and very extensively, and is generally very painful. If life continues for a few days, abscesses form in the swollen parts. Death has been known to occur in less than thirty minutes after an individual was bitten. Life sometimes continues for five or six weeks. A very curious observation which has been made is that hogs do not appear to be injured by the bites of rattlesnakes. It is a well-known fact that they frequently attack reptiles, kill and eat them. It is a popular error to suppose that snakes poison themselves. This is also true in reference to other reptiles.

Treatment.—When a person has been bitten by a rattlesnake or any other venomous serpent, the following measures should be adopted. 1. Place around the limb, a short distance above the wound, a cord, tying it as tightly as possible. A whip-cord, shoe-string, neck-tie, strap, or anything which can be made to answer the purpose of a ligature, may be used. It should be sufficiently tight to cut off the circulation. This may be accomplished by placing a small stick beneath the cord and twisting it as is shown in Fig. 355. 2. If possible, cut out the bitten part, being sure to include all of the poisoned tissue. 3. If there is no sore, ulcer, or abrasion in the mouth, it will be safe and proper to next proceed to suck the wound, as the poison will do no harm if not re-

ceived into the circulation. 4. As soon as possible the wound should be cauterized with a hot iron or live coal, or pure carbolic or nitric acid may be applied. To combat the coldness, the patient should be surrounded with

Fig. 357. Centipede.

Fig. 358. Scorpion.

hot bottles and warm blankets. Hot tea should also be given to drink. When the heart becomes weak, galvanism over the heart and hot and cold applications to the spine should be employed. There are no known antidotes for the poison after it has been introduced into the sys-

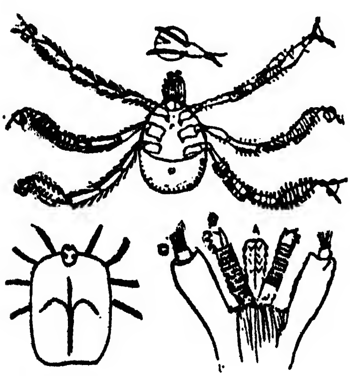


Fig. 361. Tick. *a*, *b*, *c*, Jaws of the Insect.

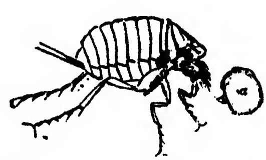


Fig. 359. Jigger. *a*, Female, natural size.

Fig. 360. Bed-bug.

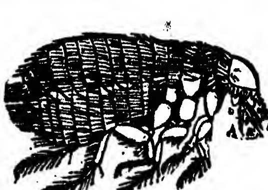


Fig. 362. Flea.

tem. Alcohol in the form of brandy or whisky has been very frequently shown to be no antidote. The popular belief that alcoholic liquors are necessary in the treatment of snake bite has been abun-

dantly shown to be without foundation. If the patient is too weak to swallow hot liquids, they should be injected into the rectum. It should be recollected that many of those bitten are not poisoned, to which fact may be attributed the supposed efficacy of many remedies which have been recommended.

When there is great stupor and numbness, the patient should be encouraged to exercise. When too feeble to exercise, the muscles may be kneaded and manipulated. If the breathing becomes greatly impeded, artificial respiration should be employed. Hot fomentations over the stomach and cold applications to the head are also useful. Drinking considerable quantities of fluid to stimulate the action of the kidneys, and the hot water bath, are measures worthy of recommendation.

Bites and Stings of Insects.—The principal insects which are capable of inflicting painful or poisonous bites or stings are fleas,

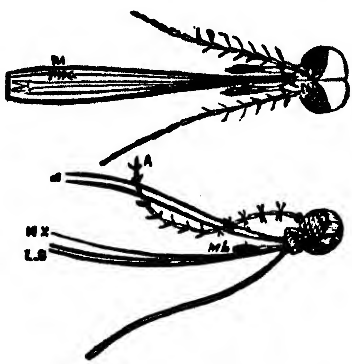


Fig. 363. Lancet of Musquito.

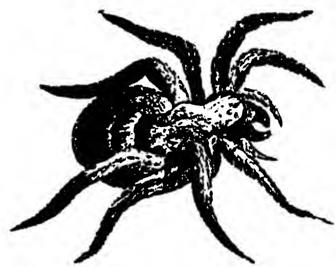


Fig. 364. Tarantula.

bed-bugs, bees, wasps, musquitoes, the midge or buffalo fly, the jigger ticks, spiders, the scorpion, and the centipede. Figs. 357 to 364.

Treatment.—The bites of such insects as the musquito, flea, bed-bug, and midge are generally relieved by bathing the parts with a weak solution of ammonia water, salt and water, or a solution of saleratus or baking soda. The same measures are useful for the relief of bee stings. When the sting is left in the wound, it should be carefully withdrawn. When a person is stung upon the inside of the mouth, a hot solution of salt and water should be used as a mouth-wash or gargle. Hot vinegar is useful for the same purpose. If the parts become very much swollen, so as to produce suffocation, they should be lanced and allowed to bleed freely. The bites of the spider and scorpion are

to be treated upon the same principles. If abscesses or boils form, they should be lanced and treated as other boils.

The bite of the centipede is a much more serious matter, and should receive attention the moment it is inflicted, or as soon as possible, as death has sometimes occurred within a few hours. The part bitten should be incised with a sharp knife and encouraged to bleed freely by sucking or soaking in hot water. The treatment should be the same as recommended for bee stings and the bites of other insects, unless severe symptoms should develop, when the directions given for treatment of snake bites should be followed.

BRUISES.

For severe contusions in consequence of a blow received on any of the soft parts of the body, apply at once fomentations as hot as can be borne. The hemorrhage beneath the skin which frequently occurs in consequence of a severe bruise, may generally be prevented by firm compression immediately after the injury. It is a custom among German mothers when a child falls, striking its head severely, to apply the convex surface of the bowl of a teaspoon immediately upon picking it up. The compression can be kept up by means of a pad and bandage as long as desired.

Much of the discoloration which results from bruises, which is particularly undesirable when the eye is the part injured, may be prevented by the continuous application of hot fomentations for some time after the accident. The sooner the hot applications can be made, the better. The object of this treatment is to cause contraction of the blood-vessels and thus diminish the amount of hemorrhage. Cold is very efficient for the same purpose, but it should not be applied for more than half an hour without removal for a few minutes, as the blood-vessels become paralyzed. Alternate hot and cold applications are better than either hot or cold alone. An additional advantage in the use of hot applications is the removal of the soreness of the parts. Hot fomentations are also one of the best means for relieving the pain which accompanies fractures of bones occasioned by a blow or fall.

Lotions of various kinds are recommended for the prevention of discoloration. Probably water alone, equal parts of alcohol and water, or a lotion of common salt and vinegar, are as efficient as any that can be employed. A favorite remedy with some, for bruises and contusions, is tincture of bryonia. We do not think, however, that any of these

remedies are better than hot water faithfully applied. When there is a marked tendency to inflammation, as indicated by heat, redness, swelling, and much pain, cold applications should be vigorously applied. When suppuration has taken place, poultices should be employed. If the patient has high fever and chills, the abscess should be lanced.

Arnica is a popular remedy for bruises, but its use is of doubtful propriety, as it frequently produces local symptoms of poisoning, and often gives rise to disease of the skin of parts to which it is applied. When a person has been much jarred, as by a considerable fall, or more or less bruised all over, a hot full bath or a hot blanket pack will give more relief than any other remedy. This measure should not be employed, however, when the patient is faint.

In case a person has been bruised about the trunk or body, by having a tree fall upon him or being run over by a wagon wheel, the services of a skillful surgeon should be obtained as soon as possible. Hot fomentations or a hot full bath may be employed in the meantime.

Bruises upon the head in consequence of severe blows or a fall, often give rise to serious symptoms on account of fracture of the skull and compression of the brain, or from simple concussion, or jarring, of the brain. If a person is insensible or partially paralyzed in consequence of an accident in which the head is injured, surgical advice should be secured at once. As a general rule, continuous cold is the best application for injuries resulting from severe blows upon the head. Fomentations may be applied at intervals to relieve soreness, but the application should be not longer than five or ten minutes at a time.

Injuries to the joints require perfect rest and the application of cold to the injured part, until danger of inflammation is past, when the joint should be carefully moved daily to prevent its becoming stiff.

STRAINS.

In consequence of severe exertion, some of the fibres of a muscle or of its tendon may be ruptured. This is what is termed a strain. Hot fomentations should be applied, and the injured part kept at rest. If necessary, large adhesive straps should be applied over the injured part to keep it quiet. Sometimes complete rupture of the tendon occurs. This is most likely to occur in the largest tendon of the body, that known as the tendon Achilles, which connects the muscles of the calf to the heel bone.

In treating this accident, a slipper should be placed upon the foot, to the heel of which a strap is attached. The upper end of the strap should be attached above the knee in such a way as to extend the foot completely and partly flex the leg.

SPRAINS.

A sprain consists of a laceration or rupture of the ligaments surrounding and supporting the joints, in consequence of unnatural strain brought to bear upon them. To relieve the pain, apply fomentations; to prevent inflammation, apply cold after the pain is relieved. A hot foot-bath taken immediately after the sprain is an excellent remedy. In some cases, cold applications give more relief than hot. A smooth roller bandage should be applied from the toe up, as soon after the accident as possible. The most recent and successful method of treating sprains is by means of massage, very light at first, and gradually increasing in vigor from day to day. Baths and bandaging may be advantageously combined with massage. Treated in this manner, most cases of sprain recover in a week.

BURNS AND SCALDS.

If possible, immediately immerse the injured part in water at about the temperature of the body. Very extensive burns in which considerable portions of the skin are destroyed, are best treated by the continuous bath, the patient remaining immersed in water until the new skin is formed. Patients have been kept immersed in this way for months, in some instances with the result of securing recovery when no hope was afforded by any other means. No harm results from prolonged immersion, provided the water is changed as it should be, once or twice a day. An excellent means of relieving the pain of an extensive burn, is the application of common baking soda. This generally relieves the pain to a very great extent in a short time, and seems to promote the healing process wonderfully. Portions of charred clothing and other foreign matter should be removed by a stream of warm water, or immersion of the part in warm water, and the injured surface should be thoroughly covered with the dry soda. The part should then be covered with cotton-wool or common wadding. Carron oil, consisting of equal parts of lime-water and linseed oil, is a favorite remedy with many, but has the disadvantage of being very dirty and having an unpleasant odor. Carbolated vaseline, containing ten drops of carbolic acid to the ounce, is an excellent application. It should be spread upon thin cloths with a case-

knife to the thickness of a knife-blade, and applied over the burnt surface. When suppuration occurs, the injured surface should be thoroughly washed two or three times a day with warm water and castile soap, and afterward rinsed with a 1–2500 solution of bichloride of mercury. If the burned parts are very badly swollen with œdema, as is frequently the case with burns of the face and scalp, hot fomentations should be applied to stimulate the circulation.

We once had the opportunity of trying this method of treatment in the case of an engineer who was badly burned by an explosion of gas, and with the most excellent results. A remedy which has been recently recommended very highly is *thymol*. It is to be used in the proportion of one part to one hundred of linseed oil at first, and afterward in proportion of one part to one thousand of oil. It should be applied several times a day.

When the patient suffers with chilliness and other symptoms of shock, the treatment recommended for this condition should be given. (See page 1395.) The fever which frequently accompanies extensive burns, especially after suppuration begins, should be cautiously treated by means of tepid sponging, full baths, and large tepid compresses about the body.

Scalds of the mouth, which occur most frequently in children who sometimes attempt to drink from the spout of the tea-kettle, require a warm moist atmosphere. This may be secured by enveloping the head of the patient in a blanket or oil-cloth and conducting beneath the covering steam from a tea-kettle by means of a rubber hose. A better means, however, of using warm vapor in these cases is the steam inhaler. (See page 802.) If there is great swelling of the epiglottis, so as to interfere with the breathing, lancing sometimes becomes necessary.

FRACTURES.

Fractures of bones are very common in connection with other accidents. Old people are especially liable to injuries of this kind on account of the increased proportion of earthy matter in the bones in old age. Fractures of long bones in children are very likely to be but partial, or what is known as "green-stick" fracture. Fractures may occur from a blow, fall, or violence of any kind applied directly to the limb, or may result from indirect violence, the bone being broken in consequence of a blow received upon some other part of the body, as in fracture of the collar-bone from a fall upon the hands, or the base of the

skull from force received upon the top of the head. Bones are also sometimes broken in consequence of violent muscular action, as in fracture of the knee-pan which occasionally occurs in consequence of violent efforts in jumping.

Fractures are variously classified as complete or incomplete, transverse or oblique, crushed, impacted, simple or compound. Simple fracture is one in which the skin is not broken. In compound fracture the injury to the bone is accompanied by a lacerated wound of the part. This is a much more severe accident than simple fracture.

Fractures are indicated by pain, swelling, change in the form of the injured part, and a grating sound or crepitus felt by rubbing the ends of the fragments together. Loss of power of the voluntary motion in the limb, and an unnatural degree of mobility shown upon manipulation, are other characteristic signs. In examining limbs supposed to be fractured, they should be carefully compared with those of the opposite side.

The Healing of Fractures.—The bones heal very slowly compared with most other tissues. The process of repair consists in the throwing out of a sort of cement about the ends of the fragments of the injured bones, which forms what is known as a *callus*, which is deposited in such a way as to constitute a sort of splint for the bone. At first, the callus is somewhat cartilaginous; after a time it becomes changed to bone. In very rare cases, the bones fail to unite, though this does not, according to Prof. Hamilton, occur in more than one case in five hundred. More or less deformity remains even if the parts are exactly coäpted to each other. If the bones are not accurately set, or if after being set they are not properly kept in place, a considerable degree of deformity may result.

In some cases union takes place with the bones at more or less of an angle with each other. A deformity may also result from a shortening of the fractured limb due to overlapping of the fragments. This is especially frequent in fractures of the thigh in which more or less shortening generally occurs, the amount varying from a small fraction of an inch to two or three inches. If the shortening is not more than an inch, it will scarcely be noticed by the individual himself, and will not be observed in his walk.

Stiffness of joints in the vicinity of fractures is often found after recovery from the injury, being due either to interference with the motion of the joint by the callus, or to long-continued disuse of the joint.

General Treatment of Fractures.—The limb should be restored at once as nearly as possible to a proper condition, and hot fomentations should be applied to relieve and prevent soreness and inflammation. As soon as possible, a surgeon should be called to set the limb. This is not generally nearly as painful an operation as commonly supposed, it being seldom necessary to apply any very great amount of force to get the parts into proper position. In case very great swelling has occurred before an opportunity is afforded to set the bones, hot fomentations or alternate hot and cold applications should be employed until the swelling and inflammation are reduced, before any attempt is made to set the broken bones.

The greatest difficulty against which a surgeon has to contend in the treatment of fractures is the contraction of the muscles, by means of which the fragments are drawn apart. This may generally be overcome by putting the limb in a condition in which the muscles will be as completely relaxed as possible.

Fig. 365.

In setting bones, the lower fragment is drawn firmly down, the upper one being held in position, or drawn in the opposite direction. This is always necessary to cause the ends of the bones to come together properly. It is generally necessary, however, to make some degree of pressure upon the sides in order to secure perfect adjustment of the parts. After the bone has been set, a proper splint or other apparatus should be applied in such a way as to keep the parts in position. In measuring limbs to see if they are of the same length, as should always be done, care should be taken to put both limbs in the same position, and to take measurements from the same points.

Compound fractures require very careful management, and with the best of care not infrequently result in considerable deformity.

Bandages.—Bandages are made of cotton, cotton flannel, ordinary drilling, or of very thin, loose muslin, according to the purpose for which they are to be used. In the application of bandages to fractured limbs great care should be taken to apply them with even pressure, and not so tight as to interrupt the circulation of the blood. Figs. 365 and 366 represent the roller bandage and the mode of applying it, and Fig. 367 the appearance of the limb after the bandage has been properly applied. The width of bandages varies from one to three or four inches. In making them, care should be taken to remove all loose threads from the edges.

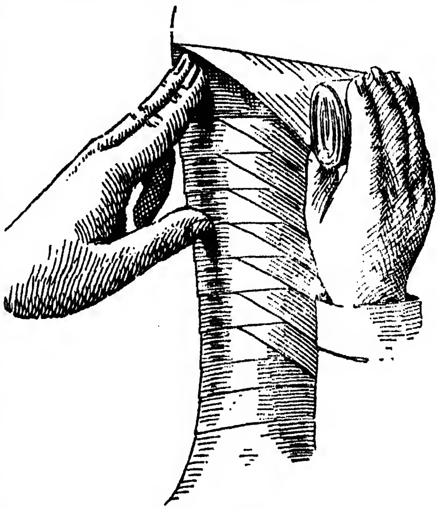


Fig. 336.

The plaster-of-Paris bandage is very useful in the treatment of many fractures. It is made by rubbing into a cloth bandage with loose meshes dry plaster-of-Paris, as much being rubbed in as can be held by the cloth, the bandage being rolled as the plaster is rubbed in. In using, the bandage should be placed in water for two or three minutes and then applied to the limb as rapidly as possible.

Bandages saturated with flour starch are sometimes employed. Glue, shellac, silicate of soda, or soluble glass, and paraffine, have also been used in a similar manner. The advantage of bandages of this kind is that they obviate the necessity for splints—themselves forming most perfect splints—giving the parts equal pressure on all sides. In case it is necessary to remove the bandage occasionally for the purpose of giving the limb attention, it may be easily done by cutting open one side and springing the sides so as to allow the bandage to be slipped off the limb.

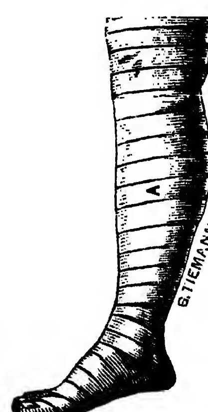


Fig. 367.

Splints.—These are supports of various kinds used in the treatment

of fractures. They are composed of various materials, and are of different forms, according to the parts to which they are to be applied. The old-fashioned wooden splint is now largely displaced by coarse flat splints which are supplied in sets. Leather, gutta-percha, and various other substances are frequently employed, and possess the advantage that they may be molded to any part after having been rendered flexible by soaking in hot water. Heavy pasteboard or binder's board may be used in the same way. In case of emergency a shingle, or a piece of thin board of any sort, may be made to answer the purposes of the splint.

In the use of splints, they are padded by strips of folded flannel or strips of cotton, and are placed on either side of the limb in such a way as to hold the ends of the fractured bone together, the bandage being applied around the outside. Special appliances are required in the treatment of special fractures, such as apparatus for extension, cradles for suspending the limbs, fracture boxes, inclined planes, etc.

Pyæmia and Septæmia.—These are conditions of the system in which there is general poisoning from the absorption of pus or germs. They often occur in cases of compound fracture, the ends of the broken bones with their numerous open blood channels presenting the most favorable opportunity for absorption. The occurrence of pyæmia or septæmia is indicated by fever, the pulse being small, quick, and irregular. Delirium and stupor are often present. Severe chills, followed by fever and profuse sweating, with extreme depression, are also present. If the wound is discharging, the matter changes from the natural creamy color and consistency, to a bloody or dark thin fluid. The skin about the wound becomes bluish or purple, healing ceases, and the wound gaps open. The joints are affected with rheumatic pains, sometimes abscesses forming in them. Breathing is difficult and increased in frequency.

Pyæmia occurs in connection with other conditions, as well as in fracture. Whenever it occurs, from whatever cause, the wound from which absorption takes place should be thoroughly disinfected by washing with an antiseptic solution (see Appendix), and then stuffed with iodoform gauze. The sick-room should be thoroughly ventilated. Disinfectants should be thoroughly used for the purpose of disinfecting the discharges from the body. For directions relating to the use of disinfectants for this purpose, see page 577.

Massage.—Massage has recently been resorted to in the treatment of fractures, and with excellent success. It is especially valuable in

cases of ununited fractures, but must, of course, be employed under the direction of a skilled and experienced physician.

Fractures of the Skull.—In fractures of the bones of the skull, some of the fragments are very likely to become depressed upon the brain, occasioning loss of consciousness, or other disturbances of the nervous system. Sometimes blood-vessels are damaged, so that a large clot is formed in the brain, giving rise to symptoms similar to those which result from apoplexy.

The proper treatment of these cases consists in lifting up or removing altogether the depressed portion of bone, an operation known as trephining.

Fractures of the Spine.—When the back, or spinal column, is broken, the spinal cord is almost always more or less injured, the result of which is paralysis of the lower extremities. In these cases the bowels and bladder, as well as the lower extremities, are usually paralyzed. The patient should be kept quiet in bed. The urine should be drawn with a catheter, and the bladder should be washed out daily. Complete recovery is very doubtful.

Fig. 368.

Fracture of the Nose.—Fracture of the bones of the nose is readily recognized by the characteristic deformity. Great swelling usually occurs in a very short time, sometimes making it difficult to tell whether there is fracture or not. Hot fomentations should be applied at once, as by this means pain and swelling and subsequent inflammation may be very much diminished. A pencil should be passed up into the nose, and by its aid, together with manipulation by the fingers, the depressed bone should be lifted into position. The bones may be held in place by means of a little wooden plug smeared with vaseline, or plugs of cotton saturated with sweet oil.

Fracture of the Lower Jaw.—This is generally the result of a blow upon the face. It may be most easily recognized by an examina-

tion of the teeth, which are thrown out of line when the jaw is fractured. After the broken parts are put in proper position, a bandage should be applied as shown in Fig. 368. Sometimes the services of a dentist are required.

Fracture of the Upper Jaw.—Fracture of the upper jaw occurs very rarely. The parts should be put in as good position as possible, and held in place by adhesive straps and bandages.

Fracture of the Collar-Bone.—This is the most frequent of all fractures. It occurs most often in children. It is indicated by pain, dropping of the shoulder, swelling over the broken bone, irregularity, and a grating sensation when the shoulder is moved. There is no

Fig 369. Front View.

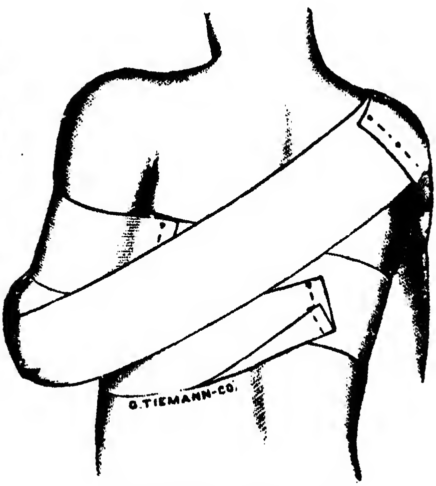


Fig. 370. Back View.

difficulty in setting a fracture of the clavicle, but it is by no means easy in all cases to hold the fractured ends in position. The most simple method of treating fracture of the clavicle is a figure-of-eight bandage made out of a pair of suspenders which are passed in front of each shoulder, and crossed and buckled behind, making a figure 8, the shoulders being included in the loops. By this means the shoulder of the injured side may be drawn back, so that the ends of the bones are brought near together. Our respected teacher, Prof. Sayre, of Bellevue Hospital College of New York, has devised a very simple method of treating these cases by means of adhesive straps. (Figs. 369 and 370.)

Fracture of the Ribs.—In cases of injury to the chest, it is often found very difficult to determine whether or not the ribs are broken. When fracture has occurred, there is generally sharp pain at a definite point, which is increased by deep breathing or coughing. In cases of fracture, these symptoms are generally aggravated when the patient lies down. Sometimes grating of the ends of the bones, or crepitus, can be distinctly made out.

In doubtful cases it is best to apply a broad bandage tightly about the chest; this will usually give relief. When the fracture can be made out with certainty, strips of adhesive plaster should be applied to the affected side in the manner indicated in Fig. 371.

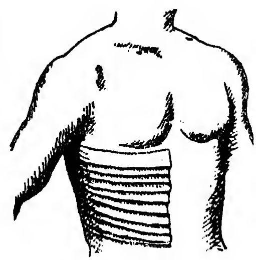


Fig. 371.

Fractures of the Humerus, or Arm-bone.—A fracture of this kind may occur near the shoulder, the elbow, or midway between these points. When the fragments are impacted, that is, crowded together by the force of the blow, the arm should be placed in an easy position and kept quiet. If the fragments are not attached or impacted, they should be set. The splint should be applied in such a way as to hold the fragments in place. The simplest method is that of Dr. Hamilton. The splint recommended by him may be made of pasteboard, felt, leather, or other material. Its form is shown in Fig. 372. It should be long enough to reach above the point of the shoulder. The edges of the notch in the upper end should be brought together by means of stitches, and while flexible the splints should be molded to the shape of the shoulder and arm, and allowed to become dry. Another short splint should be placed upon the inside of the arm. Each splint should be padded or covered with woolen cloth; it should then be secured to the arm by means of rollers, and the arm placed in a sling. It is well to bandage the arm before applying the splint, beginning at the fingers.

Fig. 372.

This method is applicable to fractures in the upper part of the arm. When the fracture occurs at the middle or lower part of the arm, a splint in the form of a right angle and of sufficient length to reach from the shoulder to the wrist should be employed for the inside of the

arm, a short splint reaching from the shoulder to the elbow being placed upon the outside. After the fragments have been adjusted, the splints, properly padded, should be secured in place by proper bandages. When the elbow or other joints are much injured by the accident producing the fracture, the pain and inflammation should be subdued by the use of hot and cold applications before the splints are applied. When any of the nerves of the arm are injured so as to produce paralysis, the application of electricity should constitute a part of the treatment.

Fractures of the Fore-Arm.—Either one or both bones of the fore-arm may be broken, but the treatment remains the same as in other cases. The splints required for this fracture should be of sufficient length to reach over the end of the elbow and to the middle of the palm. They should be a little wider than the arm itself, so as to take off the pressure of the bandage. Care should be taken not to cut them so wide that the arm will be loose. The splints should be applied in such a way that the elbow can be flexed. In setting the bone, the arm should be drawn with the palm upward so as to make the bones parallel inside of the hand. The splints should then be applied and the arm drawn with the thumb upward. While held in this position, straps of adhesive plaster may be applied around the end of each, which may be afterward reinforced by a bandage.

When the radius, or outer-bone of the arm, that upon the thumb side, is broken, the hand drops to one side. This fracture, known as Colles fracture, is occasioned by a fall upon the hands. It is also sometimes called "back-door" fracture, because it so frequently occurs from slipping upon the ice in stepping from the back-door. The term "silver-fork" fracture is also applied to it on account of the shape of the wrist which resembles the bend at the point where the shank of the fork joins the tines.

The limb is very rarely perfectly restored. After this accident, more or less stiffness of the wrist generally remains. This fracture is best treated by means of a pistol-shaped splint for the inside, reaching from the elbow to the ends of the fingers, and a short, strait splint, reaching from the elbow to the wrist, for the outside of the arm. The splints should be carefully stuffed or padded on the inside. The hand should be brought up into position as nearly as possible and the splints applied and kept in position by a roller bandage. Considerable

care should be taken in the treatment of this fracture, as not infrequently considerable swelling occurs, which sometimes results in loss of the hand. After the splint has been adjusted, the arm should be put in a sling.

Fracture of the Bones of the Hand.—Fractures of this kind may occur from a blow upon the back of the hand or striking some hard object with the knuckles. In treating it, the ends of the fragments should be placed in position, and a ball of yarn placed in the hand for the patient to grasp. The bandage should then be applied. A little deformity remains, but the usefulness of the hand is not impaired.

Fracture of the Fingers.—There is no difficulty in recognizing fractures of the fingers. They are very easily treated. It is only necessary to see that the fingers are in a natural position, and that the palmar surface is not drawn to one side. Even if the soft parts as well as the bones have been completely severed, if the parts have not been crushed too much, union will often take place, and the severed fragments should be brought together and kept in position. A piece of pasteboard or wood, or a perforated zinc or tin, should be placed upon the palm side of the fingers after the fragments have been adjusted, and the bandage should be applied. The starch or plaster bandage is very useful in these cases.

Fracture of the Thigh.—Fractures of the thigh may occur at the neck of the femur, its most constricted portion, or in some portion of the shaft. Fracture of the neck is most likely to occur in old people. It has been produced in elderly persons by a very slight degree of violence, as tripping on the carpet or door-sill, making a misstep, or some other equally insignificant fall.

Fracture of the neck is generally produced by a blow or fall upon the foot, or knee, or upon the outside of the hip. Pain and swelling are present as in other fractures. There is a slight change in shape of the hips, the outer portion of the injured hip being flatter than the corresponding portion of the outer side. The foot is drawn outward, the limb is shorter, and there is loss of power to use the limb.

Fractures in the shaft of the thigh are most often the result of direct violence, as a severe blow, being run over by a wagon, a fall from a considerable height, etc. The symptoms of this form of fracture are change in the form of the limb, unnatural motion, shortening of the limb, and turning of the foot outward. In determining the length of

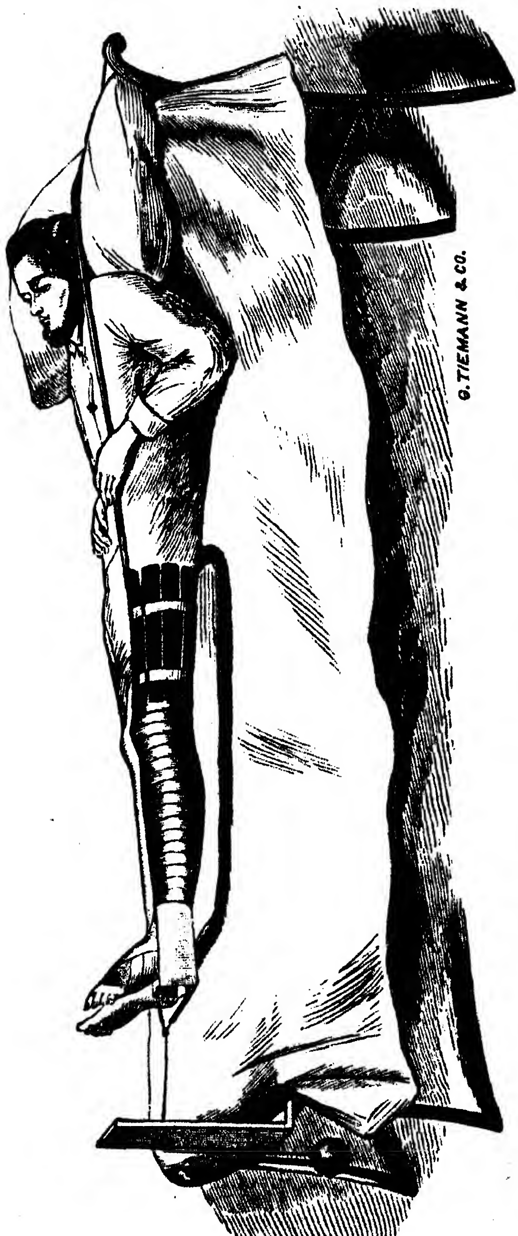


Fig. 873.

the shortened limb, in fracture of the thigh, great care should be taken in measurement. The clothing of the patient should be removed, and he should lie on a flat surface, the legs parallel with each other and in line with the body. One end of a string or tape-line should then be held at the navel while measurements are taken to the upper side of the bony prominence on the inside of each ankle.

This form of fracture should receive the attention of a careful surgeon,—as even with the very best of treatment, more or less deformity will be likely to result. Various methods of treatment are recommended. When the bones are impacted, all that is required is that the patient should remain in bed and keep the limb quiet while the healing is taking place. A plaster-of-Paris bandage is very useful in these cases. When the fragments are not driven together, any one of several methods may be employed. Probably the safest of these

is that known as extension, in which the patient is placed in bed and extension applied to the injured limb in such a way as to overcome the tendency to shortening, which is likely to occur in consequence of contraction of the muscles. A very convenient form of apparatus of this sort is shown in Fig. 373, in which the weight is attached by a rope passing over the pulley to a broad band of adhesive plaster which is secured to the leg by a roller bandage. Counter extension is made by means of a strap, which passes between the thighs and is attached to the upper end of the bed-stead. Sometimes the counter extension is made by having a foot-board raised eight or ten inches, so that the weight of the body will counteract the tendency of the weight to draw the body back to the foot. Some surgeons employ the plaster-of-Paris bandage in these cases. Others recommend very highly the double-inclined plane. Two or three months are required

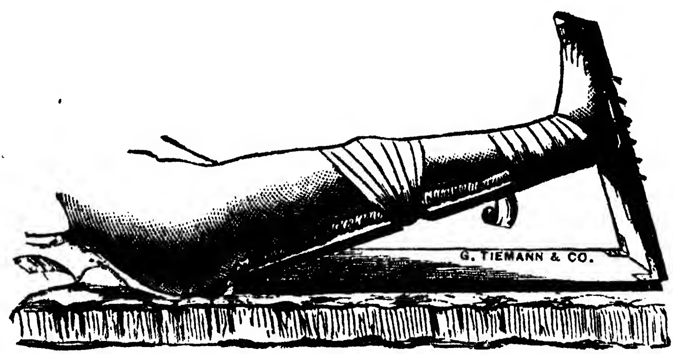


Fig. 374.

to effect a union in these cases, and from one-fourth of an inch to two inches or more shortening will be likely to occur in most cases.

In many cases the limb is never restored to its full usefulness, always remaining weak and lame. When the fracture is treated with the limb extended, the knee is generally found to be stiff when the dressing is removed, and this difficulty must be overcome by fomentations and daily manipulations. In cases in which more than partial recovery occurs, it is generally ten or twelve months before the patient is entirely well.

Fracture of the Knee-pan.—The patella, or knee-pan, may be broken transversely or vertically. In some cases it is shattered by a severe fall or blow. This fracture is generally occasioned by violent

jumping, or a sudden movement to avoid falling backward. The fragments of the broken bone generally unite in six or eight weeks, but it is quite rare that actual bony union takes place, the parts being generally bound together by a sort of ligament. Very little inconvenience is experienced, however, unless the ligament becomes stretched, as is sometimes the case even to the extent of three or four inches.

The best method of treatment is that suggested by Prof. Hamilton which is so well shown in Fig. 374, that further description is unnecessary.

Fracture of the Leg.—Either one or both bones of the leg may be fractured. The tibia, or inner bone of the leg, which forms the shin, although much stronger and larger than the outer bone, is most frequently broken on account of being less well protected by muscles. What is known as Pott's fracture is an injury in which the outer bone of the leg is broken at a point about three inches above the ankle, and the inner ankle is either broken or separated from the heel bone by laceration of the ligaments. The result of this accident is turning of the sole of the foot inward. When the tibia is broken, the point of fracture can generally be quite easily found by feeling along the shin. The outer bone is so thoroughly covered by muscles that it cannot be so easily felt, but the crepitus can generally be distinguished.

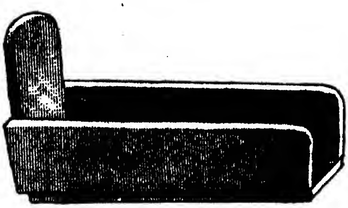


Fig. 375.

Treatment.—The bone should be set, and the limb placed in the fracture box, an illustration of which may be seen in Fig. 375. A piece of cloth a yard long and about two feet wide should be placed in the box in such a way as to cover the bottom and sides, the edge of the cloth hanging over outside of the box. A quantity of dry bran or sand should next be placed in the box, a sufficient amount being poured in to form a cushion for the foot and lower part of the leg, to the shape of which it should be molded. Bran or sand should be poured in around the sides of the leg. Bran or sand is necessary only in cases in which there is a wound, which are very frequent in this form of fracture. Dr. Hamilton's method of treating fractures of the leg is by means of the plaster-of-Paris bandage. Ordinary splints of pasteboard or other material may also be successfully used in cases of fracture of

the lower end of the fibula in which the foot is turned to one side. The legs should be supported on pillows or cushions, while fomentations are applied over the seat of the injury until the inflammation is reduced. Then the foot should be bound and held in position by means of a splint extending from above the knee to a few inches below the foot. The splint should be carefully padded and applied to the inner side of the limb, the foot being strapped down in such a manner as to bring it into its natural position. The plaster-of-Paris splint is also applicable to these cases. As the ankle is apt to be stiff, the splints should be removed as early as possible. Passive movements should be employed diligently for the purpose of overcoming the stiffness.

Fractures of the Bones of the Foot.—The bones of the heel and the ankle are the most likely to be broken. Fractures of the bones of the foot are sometimes very difficult to recognize. Stiffness of the ankle joint, with a limping gait, are likely to result from severe fracture of the bones. Although union generally takes place quite promptly, it is often several months before the patient is able to use the foot much in walking. Before splints are applied, hot fomentations should be employed to reduce the soreness and inflammation. When this has been accomplished, splints should be applied in accordance with the principles already explained.

DISLOCATIONS.

Dislocations are often very easily confounded with fractures; in fact, the two injuries are often inflicted at the same time. The chief distinguishing features of dislocations are, unnatural position of the limb, altered shape of the injured joint, and less than the natural degree of motion in the joint. Pain and swelling, and more or less discoloration, are also usually found in the vicinity of the affected joint.

Treatment of Dislocations.—The first thing to be accomplished is reduction of the dislocation, or returning of the bone to its natural position. This should be accomplished at as early a moment as possible, and can generally be done if attempted immediately after the accident without any very great difficulty, by simply pulling upon the limb in such a way as to draw the bone toward the socket at the same time manipulating the displaced end in such a way as to facilitate its return to its natural position. One of the great obstacles in the way of reducing a dislocation is the contraction of the muscles, which is in

some degree involuntary, though in the greater part voluntary, as is shown by the fact that if the patient's attention is diverted, the muscles become relaxed and the process of reduction is greatly facilitated. This may generally be accomplished by asking the patient a question, or speaking to him in a rather loud and quick tone of voice just at the time the reduction is to be attempted. In very bad cases the use of chloroform or ether is necessary in order to cause the muscles to relax. In moderate cases, however, continuous and firm pulling upon the limb will, after a time, tire the muscles so that they will relax and allow the bone to return to its place. After the reduction has been accomplished, the limb should be kept perfectly quiet until the torn ligaments of the injured tissues shall have had time to heal. It is generally necessary to apply bandages to the part, and sometimes a splint is required. When there is much pain, swelling, or inflammation, hot fomentations should be applied, or a hot shower or pour may be used. If hot applications increase the pain, cold or even ice compresses should be employed.

In some cases, alternate hot and cold applications give most relief. The drop bath, Fig. 208, is very useful in many of these cases. A joint which has been injured by dislocation should be used very little for three or four weeks. If it becomes stiffened, hot fomentations and gentle manipulations will soon restore it to a useful condition. It should be recollected that a bone which has once been put out of joint, is very liable to get out of joint again, and special care should be taken to protect it from any violence.

Dislocation of the Jaw.—Dislocation is usually recognized by the chin being thrown to the opposite side if the displacement occurs but on one side, and in wide gaping of the mouth when the dislocation occurs upon both sides at once. This accident is most frequently caused by yawning or violent laughing. It may be easily reduced by passing the thumbs, well protected by a bandage or towel, to the back side of the mouth and making a downward pressure upon the back teeth. When this is done the muscles of mastication draw the bone into place. Care should be taken to avoid a recurrence of the accident, to which a person having once suffered is especially liable.

Dislocation of the Shoulder.—The most common of all dislocations is displacement of the upper end of the arm-bone into the axilla. This may generally be recognized by measuring the shoulder

by means of a tape passed under the armpit and over the top of the shoulder. If one shoulder is dislocated, it will be one or two inches larger than the sound shoulder. This dislocation may usually be easily reduced in the following manner: The patient being seated in a chair, the operator stands by his side, and placing one foot upon the edge of the chair, brings his knee into the axilla and forcibly bends the arm over it. In case this does not succeed, the patient should lie down upon the sofa while the operator, standing by his side, places his foot in the armpit, and taking hold of the hand of the patient or of

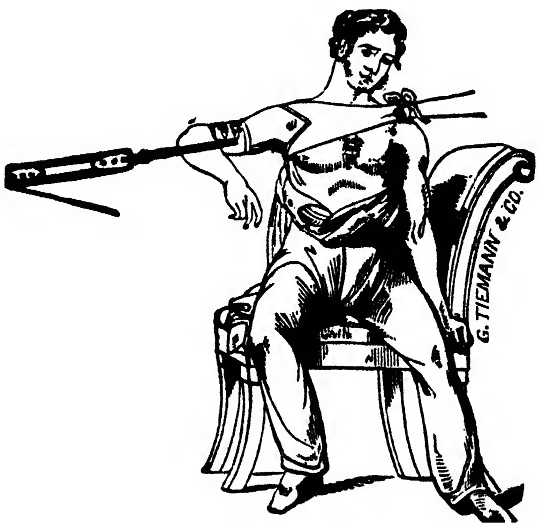


Fig. 376.

the ends of a stout bandage which is fastened about the arm, pulls steadily and with considerable force for one or two minutes; then bring the arm to the center of the body, and the head of the bone will almost always slip into its socket at once.

The old-fashioned plan of reducing dislocations of the shoulder was by means of the pulley, as seen in Fig. 376. This method is now seldom employed, however. It is found that in many cases dislocations of the shoulder can be readily reduced by gentle manipulation applied with very little force. In case a person suddenly suffers dislocation of the shoulder while alone, as in the field, he may succeed in reducing the dislocation himself by reaching over a fence and grasping one of the lower boards with the hand of

the injured side, then throwing his weight upon the affected side in such a way as to sustain the weight of the body by the injured shoulder. In some cases the application of an apparatus is necessary to retain the dislocated shoulder in position until the lacerated ligaments have an opportuity to heal. Fig. 377.

Dislocations of the Elbow.—When the elbow is dislocated backward, the most common form, the point of the elbow will be found projecting much more than naturally, and it will be impossible to bend the arm more than to a right angle, though it may be drawn out without pain. This dislocation can generally be reduced very easily by simply placing the knee in the bend of the elbow and bending the arm around the knee while pulling upon it with considerable force. After the dislocation is reduced, the arm should be placed in a sling. Hot fomentations should be applied to relieve soreness, and if inflammation threatens, cool or ice compresses should be used, as much as is necessary.

Fig. 377.

Dislocation of the Wrist.—This is a very rare displacement. It is indicated by an abnormal position of the hand and immobility of the wrist joint. All that is required is firm pulling upon the hand, which causes the displaced bones to slip into position.

Dislocation from Pulling the Arm.—This is a form of dislocation which occurs in young children in consequence of being pulled forcibly by the arm. There is still some question among surgeons as to the exact nature of the dislocation, some claiming that the dislocation is at the wrist, and others at the elbow joint. It is probable that either joint may be affected. The hand will be found turned upon the palm, the patient being unable to turn it backward. All that is necessary is to grasp the hand and forcibly turn it upon the back, which will cause the bones to resume their proper position.

Dislocation of the Thumb and Fingers.—Dislocation of the thumb is readily recognized. Fig. 378. Dislocations of the fingers are equally evident. These displacements can be readily reduced by pulling upon the thumb or fingers. If success is not readily obtained, a better purchase may be secured by means of a very simple contrivance, such as is shown in Fig. 379, which can be easily made by any one in a few minutes. A piece of shingle about a foot in length and an inch and a half in width should be perforated near one end with two pairs of holes, from an inch and a half to two inches apart, into which narrow tapes should be passed, by means of which the finger should be made fast to the shingle. By grasping the short end of the shingle, the operator can readily draw the dislocated bone into position.

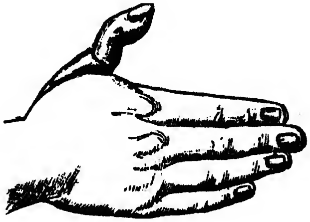


Fig. 378.

Dislocation of the Hip.—The simplest plan of treating dislocation of the hip is that known as the automatic method. The patient lies upon the floor on his back. The operator raises the injured limb to a right angle, and places the foot of the patient between his legs in such a way that the back of the foot rests against his sacrum. The limb is then firmly grasped just below the knee, and the patient is lifted until the hip is raised from the floor. The body should be

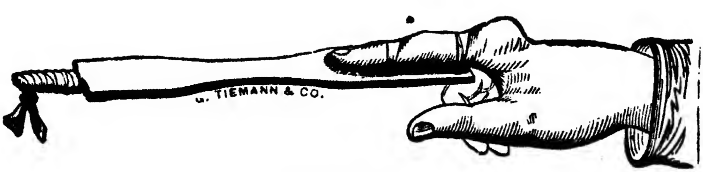


Fig. 379.

held in this position for a minute or two, by the end of which time the head of the femur will be heard to click into its socket. In case the effort is not successful, both limbs should be treated in the same way at once. If neither effort is successful after several trials, a surgeon should be called ; or if the services of a physician cannot be secured, the method by manipulation may be employed. In this, the operator with one hand grasps the affected limb by the ankle, and flexes the limb nearly to a right angle, placing the other hand just below

the bend of the knee. The knee should now be carried outward, the limb being also twisted in the same direction and then brought slowly down to its natural position. If neither of these means succeed, it may become necessary to resort to the old-fashioned method of reduction by means of pulleys, as shown in Fig. 380.

Dislocation of the Knee-Joint.—This form of dislocation is very infrequent, owing to the thorough manner in which the knee-joint is supported by ligaments. The dislocation is very easily reduced. Long-continued treatment is generally necessary, on account of the extensive injuries done to the soft parts of the surrounding knee. Alternate hot and cold applications are generallv required, together

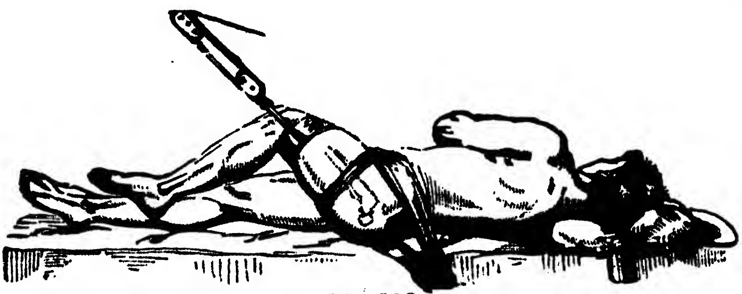


Fig. 380.

with perfect rest of the joint for many weeks. In the majority of cases the integrity of the joint is rarely fully restored. The patient should not attempt to walk upon the limb unless it is supported by a bandage of some sort firmly applied.

Dislocation of the Ankle.—This accident is generally the result of jumping. In nearly all cases, more or less fracture of the ends of the leg bones also occurs. Dislocation of the ankle joint is always present in Pott's fracture, already described. The dislocation is easily reduced by pulling upon the foot and pressing the displaced bones into position. Properly prepared splints should be applied to keep the parts in position. Hot and cold applications should be made to prevent and relieve inflammation.

Dislocation of the Bones of the Foot.—Backward dislocations at the ankle joint are generally irreducible, on account of the great strength of the heel cord, or tendon Achilles. This cord has been sometimes divided; but this should rarely, if ever, be done, since by prolonged rest and proper treatment combined, later, with passive ex-

ercises and persistent efforts on the part of the patient, the foot can be made a very useful one, even though the dislocation remains unreduced.

Other dislocations of various bones of the foot sometimes occur in consequence of great violence. They can often be reduced by careful manipulation, but in some cases resist all efforts at replacement. The displaced bones will generally accommodate themselves to their abnormal position sufficiently to render the foot very useful, even though they cannot be restored to their proper position.

Dislocation of the Toes.—This is a very rare accident. It should be treated in essentially the same manner as that described for dislocation of the fingers.

MISCELLANEOUS ACCIDENTS.

Treatment of the Drowned.—In the treatment of persons in whom life seems to be extinct in consequence of drowning, the two most essential measures are, the restoration of breathing and of heat. Life cannot be long sustained without respiration, neither can the vital forces long continue their functions when the temperature of the body is very greatly lowered. When respiration is suspended, the greatest source of production of heat is cut off, so that the patient may die from the depressing influence of cold, although respiration might be fully restored by the use of proper means. The restoration of breathing must of course be considered as the first essential; but attention should be given to the restoration of heat with almost equal promptness and thoroughness. The following rules for the treatment of the drowned were prepared by the committee on accidents of the State Board of Health of Michigan, for general circulation. They are so concise, and the measures of treatment recommended so efficient, that we are glad to quote them without modification, as follows:—

"Rule 1.—*Remove all Obstructions to Breathing.* Instantly loosen or cut apart all neck and waist bands; turn the patient on his face, with the head down hill; stand astride the hips with your face toward his head, and, locking your fingers together under his belly, raise the body as high as you can without lifting the forehead off the ground (Fig. 381), and give the body a smart jerk to remove the mucus from the throat and water from the windpipe; hold the body suspended long

enough to slowly count *one, two, three, four, five,* repeating the jerk more gently two or three times.

"RULE 2.—Place the patient face downward, and maintaining all the while your position astride the body, grasp the points of the shoulders by the clothing, or if the body is naked, thrust your fingers into the armpits, clasping your thumbs over the points of the shoulders, and *raise the chest as high as you can* (Fig. 382) without lifting the head quite off the ground, and hold it long enough to *slowly* count *one, two, three.* Replace him on the ground, with his forehead on his flexed arm, the neck straightened out, and the mouth and nose free. Place your el-

Fig. 381.

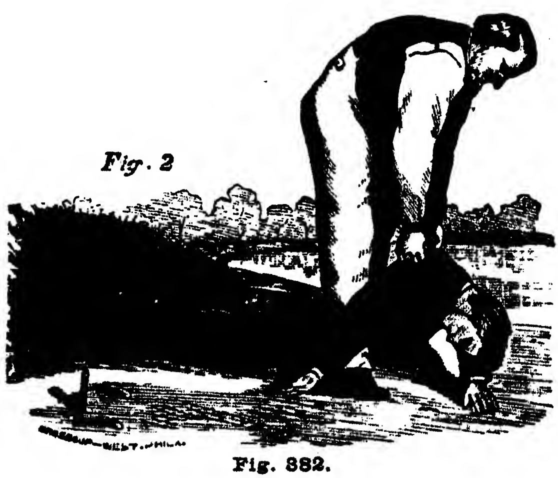


Fig. 382.

bows against your knees, and your hands upon the sides of his chest (Fig 383) *over the lower ribs, and press downward and inward with increasing force* long enough to slowly count *one, two.* Then suddenly let go, grasp the shoulders as before and raise the chest (Fig. 382); then press upon the ribs, etc. (Fig. 383). These alternate movements should be repeated ten to fifteen times a minute for an hour at least, unless breathing is restored sooner. Use the same regularity as in natural breathing.

"RULE 3.—After breathing has commenced, *restore the animal heat.* Wrap him in warm blankets, apply bottles of hot water, hot bricks, or anything to restore heat. *Warm the head nearly as fast as the body, lest convulsions come on.* Rubbing the body with warm cloths or the hand, and slapping the fleshy parts, may assist to restore warmth, and

Fig. 3.

Fig. 383.

the breathing also. If the patient can *surely* swallow, give hot coffee, tea, milk, or a little hot sling. Give spirits sparingly, lest they produce depression. Place the patient in a warm bed, and give him plenty of fresh air; keep him quiet.

"*Avoid delay. A moment* may turn the scale for life or death. Dry ground, shelter, warmth, stimulants, etc., at this moment are nothing,—*artificial breathing is everything,*—is the *one remedy,*—all others are secondary.

"*Do not stop to remove wet clothing before efforts are made to restore breathing.* Precious time is wasted, and the patient may be fatally chilled by exposure of the naked body, even in summer. Give all your attention and effort to restore breathing by forcing air into, and out of, the lungs. If the breathing has just ceased, a smart slap on the face, or a vigorous twist of the hair will sometimes start it again, and may be

tried incidentally, as may, also, pressing the finger upon the root of the tongue.

"Before natural breathing is fully restored, do not let the patient lie on his back unless some person holds the tongue forward. The tongue by falling back may close the windpipe and cause fatal choking.

"If several persons are present, one may hold the head steady, keeping the neck nearly straight; others may remove wet clothing, replacing at once clothing which is dry and warm; they may also chafe the limbs, and thus promote the circulation.

"*Prevent friends from crowding around the patient and excluding fresh air;* also from trying to give stimulants before the patient can swallow. The first causes suffocation; the second, fatal choking.

Fig. 384.

"*Do not give up too soon.* You are working for life. Any time within two hours you may be on the very threshold of success without there being any sign of it."

Figs. 384 and 385 illustrate the method employed by the U. S. Life-Saving Service. The patient upon being taken from the water "is turned upon his face, a large bundle of tightly rolled clothing is placed beneath the stomach, and the operator presses heavily upon his back over the bundle for half a minute, or as long as fluid flows freely from his mouth. Fig. 384.

"The mouth and throat are then cleared of mucus by introducing into the throat the end of a handkerchief wrapped closely around the

forefinger, the patient is turned upon his back, under which the roll of clothing is placed so as to raise the pit of the stomach above the level of any other part of the body. If an assistant is present, he holds the tip of the patient's tongue, with a piece of dry cloth, out of one corner of the mouth, which prevents the tongue from falling back and choking the entrance to the windpipe, and with his other hand grasps the patient's wrists and keeps the arms stretched back over the head, which increases the prominence of the ribs, and tends to enlarge the chest. The operator then kneels astride the patient's hips and presses both hands below the pit of the stomach, with the balls of the thumb resting on each side of it and the fingers between the short ribs, so as to get a good grasp of the waist. Fig. 385. He then throws his weight forward on his hands, squeezing the waist between them with a strong

Fig. 385.

pressure, while he counts slowly *one, two, three,* and, with a final push, lets go, which springs him back to his first kneeling position."

Sylvester's Method.—After clearing the mouth of dirt and saliva, and drawing the tongue forward, the patient is laid upon the back with the shoulders and head slightly raised. The operator then kneels behind his head, grasps the arms just above the elbows, and draws them steadily upward until they meet above the head. By this means, the ribs are elevated, and inspiration is produced. The arms are then brought down to the sides of the chest, the ribs being compressed against the chest, so as to produce expiration. These movements are to be repeated twelve to sixteen times a minute.

The application of electricity, and the use of alternate hot and cold applications to the spine, are of service in cases in which they can be used efficiently; but they should not be allowed to interfere with artificial respiration, which is the most important of all measures. In suffoca-

tion, choking, strangling, hanging, and whenever respiration is suspended by any cause whatever, the methods of artificial respiration described should be employed. In case of suspended respiration from the use of chloroform or any anæsthetic, the head should be placed lower than other parts of the body. In a case of heart failure, sharp percussion over the heart may be successfully employed. Rhythmical percussion of the tongue is a method for restoring respiration, which has recently been very highly recommended.

Lightning-Stroke.—Suspended respiration in consequence of lightning-stroke, also calls for the application of artificial respiration. Any one of the methods above described may be employed. Burns, fractures of the bones, paralysis, and various other injuries which result by injury from lightning, should be treated as when produced by other causes.

Freezing.—Parts which have been frozen should not be thawed too quickly, as more harm will be done by the rapid thawing than by the freezing. If a person has been exposed to the cold so long that considerable portions of the body are frozen, he should be carefully kept away from the fire or a very warm room, being first brought into a room of quite low temperature, where the frozen parts should be rubbed with melted snow or very cold water until they become pliable. The temperature of the room should be gradually raised, as the parts are thawed. Sometimes it is necessary to continue rubbing for several hours before the interrupted circulation is restored. After this has been accomplished, the parts should be anointed with sweet oil or vaseline. By this course, much of the injury which generally results from freezing may be avoided.

If ulceration takes place, the sore should be treated as directed for burns.

If a person finds himself in danger of freezing, through exposure in the open country in very cold weather, he should resolutely resist the drowsiness which will come over him and keep moving until the last. If a piercing wind is blowing, he should take shelter in some hollow in which there may be an accumulation of snow. The snow itself is not a bad protector from the cold, so that a person would be much safer if buried in a snow-bank than when exposed to the wind.

Clothes on Fire.—A little presence of mind at the moment when clothing takes fire, will generally prevent the frightful burns, often followed by fatal consequences, which occur by the clothing taking fire.

On the occurrence of this accident, from whatever cause, the individual should at once envelop himself in a blanket, cloak, shawl, carpet, rug, or any other article by means of which the flames may be smothered. Fire cannot burn without air. By depriving the fire of oxygen, the flames may be speedily extinguished. Fig. 386 illustrates the application of this method to a child.

Swallowing Foreign Bodies.—Small coins, buttons, and other round objects, generally create no very great disturbance if they reach the stomach, as they usually do. Much unnecessary alarm is often felt when articles of this kind have been swallowed. It is well to remember, in these cases, the ingenious remark of an eminent physician, to a mother who was much troubled because her son had swallowed a

Fig. 386.

quarter. He assured her that she need have no fears if she was sure the quarter was a good one, for good quarters would always pass. Pins and needles swallowed often find their way to the surface of the body after working through the tissues, sometimes for months and even years. Angular bodies sometimes do considerable harm, not only during the act of swallowing, by laceration of the gullet, but after reaching the stomach, in passing through this organ to the intestines. In order to obviate, as much as possible, the danger of injury from objects swallowed, the patient should be directed to eat freely of rather coarse vegetables, so as to distend the stomach and bowels.

Choking.—Sometimes portions of food, or foreign bodies of various sorts, become lodged in the throat in such a way as to produce interference with respiration by choking. The head should be held low, and an effort should be made to remove the obstruction with the finger. The advice "to go down on all fours and cough" is excellent. The plan usually followed by mothers in case of choking in children,

holding the head down, and striking the back vigorously, is a good one. Pressing upon the Adam's apple will sometimes cause an obstruction to be expelled. When a body becomes lodged in the gullet, much difficulty is sometimes experienced in dislodging it. It is sometimes necessary to pass an instrument down the throat for the purpose. What is known as the bristle probang, shown in Fig. 387, is the best instrument for this purpose.

Very small fish-bones can usually be dislodged from the throat by swallowing some rather hard food, as crackers or a crust of bread coarsely chewed; but when larger bones are caught in the throat no attempt should be made to push them down, as is often done. They should be removed from above by a surgeon.

Dirt in the Eye.—Dirt on the eye would be a more proper expression, as foreign bodies lodged upon the surface of the eyeball, or

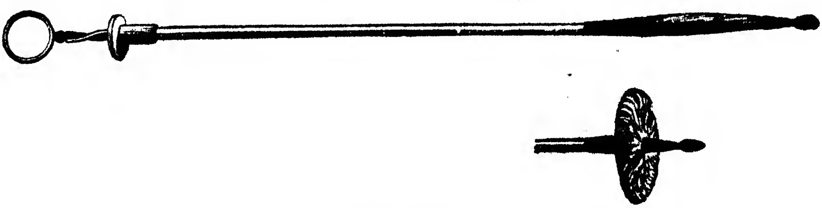


Fig. 387.

beneath the lids, are not really in the eye, but upon it Although they sometimes cause serious mischief, as well as much pain and inconvenience, they are by no means so dangerous as foreign bodies lodged in the eye, or within the eyeball. Particles of sand, dust, or other substances in the eye, may be very easily removed by the corner of a handkerchief, or by drawing the upper lid away from the eye, and gently stroking over it in a downward direction. Violent blowing of the nose, with the eyes tightly shut, will often suffice to remove particles which are not imbedded in the mucous membrane. Little bodies known as eye-stones, obtained from certain mollusks, have no specific virtue, although they are often used for the purpose of removing dirt from the eye. Flaxseed is often employed for the same purpose. The way in which these objects operate is by producing a profuse flow of tears, which carries away the obstruction. They are not to be recommended. When particles of iron, cinders, or other foreign substances are imbedded in the mucous membrane, some blunt instrument may

generally suffice to effect a removal, unless the cornea is the part involved. When the part is imbedded in the cornea, care should be used in attempting to dislodge it, that it is not pushed farther into the tissues. Such particles may generally be dislodged in the following manner: Let the patient hold the eye perfectly still, while the operator passes back and forth before the cornea, and over the object, a knife with a sharp smooth blade, gradually approaching nearer to the surface, until finally the foreign body is removed. When this is skillfully done, the eye may not be touched at all, as the foreign body generally protrudes a little above the membrane. If the particle is imbedded in the eye so deeply that it cannot be removed by any of the means described, a surgeon should be at once consulted, as much injury may result if the obstruction is not speedily removed.

Lime in the Eye.—The intense burning of lime or other caustics in the eye, is speedily relieved by the application of a little diluted vinegar or lemon juice. The eye should also be thoroughly washed. Water should be first applied, as it is generally most convenient. A solution of sugar is also recommended for neutralizing lime, as it combines with it to form a saccharate of lime.

Foreign Bodies in the Ear.—Small objects, and sometimes insects, are frequently gotten into the ear. In some instances flies have been known to deposit their eggs in the ear, which in due time were hatched into a numerous progeny of grubs. In attempting to remove objects from the ear, great care should be taken that more harm than good is not done. By far the best of all measures for this purpose is gently syringing the ear with tepid water. The head should be bent to one side, and by means of the fountain syringe elevated to a sufficient height to give a moderate force, a stream of water should be directed into the ear for some minutes. In nearly every instance the foreign substance will be removed. If the foreign body is an insect, a little glycerine may be introduced into the ear with a camel's hair brush or a feather. If these measures do not succeed, a loop of fine wire or horse-hair may often be employed with success.

Foreign Bodies in the Nose.—Foreign bodies introduced into the nose, if not crowded too far up by injudicious attempts at removal, may generally be quite readily removed by forcibly blowing the nose, the mouth and the unobstructed nostril being tightly closed. Another plan is to blow the patient's nose for him by closing the empty nostril

with the finger, and then blowing suddenly and strongly into the mouth. The glottis closes spasmodically, and the whole force of the breath goes to expel the button or bean, which commonly flies out at the first effort. This plan has the great advantages of exciting no terror in children, and of being capable of being at once employed, before delay has given rise to swelling and impaction. Sometimes the obstruction can be expelled by exciting sneezing. Care should be taken to avoid crowding the object further in. A loop of wire or a blunt hook may in some cases be successfully used. A hair-pin answers very well for this purpose. The loop end should be first employed, and if this does not answer the purpose, one of the other ends should be slightly bent in the form of a hook. A hair-pin may be used as a pair of pincers in the absence of a better instrument. If the object is not tightly imbedded, or if it is of a soluble character, it may be washed out, making the water from a syringe pass up the unobstructed nostril and out at the one containing the foreign body, or by use of the post-nasal douche.

ACCIDENTAL POISONING.

The human race is exposed to danger from poisons on every hand. These enemies to life are not only produced in the various arts in which man is engaged, but are produced in profusion by nature under various circumstances, and often under such specious guises as to render the most constant vigilance necessary to avoid injury. The materia medica also affords a long list of poisons, many of which are the most rapidly fatal of any known. Thus man is surrounded on every hand with danger to life from either direct or indirect poisoning, in addition to all the various other causes of disease to which attention has been more specially called in previous portions of this work.

In the strictest sense, a poison is any substance, which, when received into the body, occasions morbid action or disorders of the vital functions, since anything may become a poison if taken in sufficient quantity, as a person may be made sick by overeating, even of the most wholesome food. The general usage of the term, however, confines its application to such substances as, when received into the body, are capable of producing death or severe illness. An antidote is some substance capable of neutralizing or favorably modifying the injurious effects of the poison upon the system.

General Treatment for Poisoning.—Whatever treatment is employed should be applied with the utmost promptness and thoroughness. As a general rule, the first thing to be thought of is an emetic. A teaspoonful of ground mustard, or an equal quantity of powdered alum in a goblet of warm water, generally acts with promptness. If neither alum nor mustard are at hand, a teaspoonful of salt may be taken in the same way, or tepid water alone may be employed, and if taken rapidly and in sufficient quantity, vomiting will be very likely to occur. In case it is not produced promptly, the throat should be tickled with the finger or a feather. An eminent physician has recommended the following as a general antidote for poisons. It renders insoluble such poisons as zinc, arsenic, digitalis, etc., and so makes them inert. A saturated solution of sulphate of iron, two ounces; calcined magnesia, two ounces; washed animal charcoal, or bone-black, one ounce. The iron solution should be kept in one bottle, and the calcined magnesia and charcoal in another. When wanted for use, add the contents of the two bottles to a pint of water, shake thoroughly, and take from three to six tablespoonfuls.

Specific Methods of Treatment in Cases of Poisoning.—Nearly all cases of poisoning may be successfully treated by means of some one of the following methods, the particular application of which is pointed out in the alphabetical list of poisons which follows them :—

METHOD 1.

Give the patient at once a teaspoonful of ground mustard or powdered alum in a glass of warm (not hot) water, giving afterward several glasses of warm water. If vomiting is not quickly produced, tickle the throat with the finger or with a feather. Repeat the vomiting until certain that the stomach is completely empty. If the poison is of an irritating character, give milk or white of egg after vomiting.

METHOD 2.

ALKALIES.

Give two or three tablespoonfuls of vinegar in half a glass of water, or the juice of two or three lemons, then give three or four tablespoonfuls of olive oil and a large draught of milk. Do not give emetics nor use the stomach-pump. Ammonia, a volatile alkali, when inhaled,

should be antidoted by the inhalation of the vapor of hot vinegar by means of a vapor inhaler or an ordinary tea-pot.

METHOD 3.

ACIDS.

Give a teaspoonful of baking soda in a glass of milk or water. In the absence of soda, give a teaspoonful of soft soap or an equal quantity of shaved hard soap, magnesia, or chalk. Give white of egg and plenty of milk ; but do not use emetics nor the stomach-pump.

METHOD 4.

METALLIC POISONS.

Give white of egg, either clear or stirred in a little cold water, and a mustard or alum emetic. After patient has vomited freely, give plenty of milk or white of egg, or a thin mixture of wheat flour and milk. Do not wait to get the egg if it is not convenient, but give emetic at once and egg afterward.

METHOD 5.

NARCOTIC POISONS.

Give two or three tablespoonfuls of powdered charcoal. If a supply is not ready at hand, take a coal from a wood fire, quench it, fold in a towel, and crush as fine as possible with a hammer or mallet. Next apply Method 1, or excite vomiting while the charcoal is being prepared. After the patient vomits, give charcoal again freely. It will do no harm in almost any quantity. Apply ammonia to the nostrils, give strong tea or coffee, and make alternate hot and cold applications to the spine. Also apply friction to the surface, and arouse the patient by walking him about, if possible. When the respiration becomes very weak, artificial respiration should be resorted to.

METHOD 6.

COMPOUNDS OF ARSENIC.

Apply Method 1, and soon as possible give the sediment, or precipitate, obtained by adding ammonia or soda to tincture of muriate of iron. The precipitate should be thrown on a towel and rinsed with clean water two or three times. The tincture of iron can be obtained

at any drug-store, and should always be kept in the house whenever arsenic in any form is kept. It is well to give milk and white of egg freely after the patient vomits.

METHOD 7.

Apply Method 1, then give strong tea or decoction of oak-bark, or infusion of tannin.

METHOD 8.

Pour cold water on the head, make alternate hot and cold applications to the spine, and resort to artificial respiration. Hot fomentations over the heart are useful to excite this organ to increased activity when it is flagging. Artificial warmth, friction to the surface, and the inhalation of ammonia are also useful measures. In case of asphyxia from anæsthetics, the patient should be held with the head downward while artificial respiration is being practiced.

METHOD 9.

Apply Method 1 and then make cold applications to the head, hot and cold applications to the spine, and surround the patient with hot bottles or hot-water bags, or administer a hot bath or a hot blanket pack. Apply a hot fomentation over the heart. Make patient drink copiously of hot drink of some kind.

POISONS AND THEIR ANTIDOTES.

NAME OF POISON.	ANTIDOTE AND TREATMENT.
Acid, Acetic	Method 3.
Acid, Muriatic or Hydrochloric	Method 3.
Acid, Nitric	Method 3.
Acid, Sulphuric	Method 3.
Acid, Hydrocyanic or Prussic	Method 8 and inhalation of ammonia and chlorine from moist chloride of lime.
Acid, Citric	Method 3.
Acid, Oxalic	Method 3. Give also powdered chalk or plaster, sweetened lime-water, and milk.
Acid, Arsenious	Method 6.
Acid, Carbolic	Method 3.
Aconite	Method 5.
Alcohol	Method 5.
Aloes	Method 1.
Alum	Method 1.
Ammonia	Method 2 and inhalation of steam for several hours.
Anæsthetics	Stimulants, artificial respiration.
Antimony	Method 7.
Arsenic and its preparations	Method 6.
Atropia	Method 5.
Aqua Fortis	Method 3.
Aqua Regia	Method 3.
Barium and its compounds	Method 1 and Glauber's or Epsom salts.
Belladonna	Method 5.
Bitter Almonds, essence or oil of	Method 5 and inhalation of chlorine from moist chloride of lime.
Bitter Sweet	Method 1.
Bismuth	Method 4.
Blue Vitriol	Method 4.
Bromine	Inhalation of ammonia and vapor of alcohol.
Calabar Bean	Method 5.
Calomel	Method 4.
Camphor	Method 1.
Cantharides	Method 1.
Carbolic Acid	Method 3.
Carbonic Acid Gas	Method 8.
Carbonic Oxide Gas	Method 8.
Castor Oil Seeds	Method 5.
Coal Gas	Method 8.
Chlorine Gas	Method 8 and inhalation of ammonia, ether or alcohol, and steam.
Caustics (See Acids and Alkalies)	
Chloral	Method 5. Artificial respiration with head down.
Chloroform	Method 5. Artificial respiration with head down.
Chloride of Iron	Method 1, magnesia, plenty of tea.
Chromium	Method 1, magnesia or chalk in milk, white of egg.
Cocculus Indicus	Method 5.
Colchicum	Method 5.
Copper and its compounds	Method 4.
Copperas	Method 1, magnesia, large drafts of tea.
Corrosive Sublimate	Method 4.
Cotton Root	Method 1.
Creosote	Method 3.
Cream of Tartar	Method 1.
Croton Oil	Warm-water emetic, milk, and white of eggs.
Cyanide of Potash	Method 8 and inhalation of ammonia and of chlorine from moist chloride of lime.
Deadly Nightshade	Method 5.
Digitalis	Method 5 with fomentations over the heart.
Elaterium	Method 1
Ergot	Method 1.
Ether	Method 8 with the head down.
Fungi	Method 9.
Fool's-Parsley	Method 9.
Fox-glove	Method 5
Gases, poisonous	Method 8.
Gamboge	Method 1.
Garden Nightshade	Method 5.
Gelsemium	Method 5.
Green, Paris	Method 6.
Green Vitriol	Method 1, magnesia and copious drafts of tea.
Hartshorn	Method 2.
Hellebore	Method 5.
Hemlock	Method 5.
Henbane	Method 5.

NAME OF POISON.	ANTIDOTE AND TREATMENT.
Hydrochloric Acid	Method 3.
Hydrocyanic Acid.	Method 8 (See Cyanide of Potash)
Hyoscyamus	Method 5.
Indigo	Method 1 magnesia in milk.
Iodine.	Method 1 and starch or flour paste.
Iodide of Potash	Method 1.
Iron, Chloride and Sulphate of	Method 1, magnesia and plenty of tea.
Jalap	Method 1
Laudanum	Method 5.
Lead and its comp'nds	Method 4 and Glauber's or Epsom salts in tablespoonful doses in milk.
Litharge	Method 4 and Glauber's or Epsom salts in tablespoonful doses in milk.
Lime	Method 3, large doses of sugar
Lobelia Ind'n Tobacco	Method 9.
Lunar Caustic	Method 4.
Mercury, its comp'nds	Method 4.
Monk's-hood	Method 5.
Morphia	Method 5.
Muriatic Acid	Method 3.
Mushrooms	Method 9.
Narcotics	Method 5.
Nicotine	Method 9.
Nightshade.	Method 5.
Nitrate of Silver	Method 4.
Nitrate of Potash	Method 1.
Nitrate of Mercury	Method 4.
Nitre	Method 1.
Nitric Acid	Method 3.
Nitro-Benzol	Method 9.
Nitrous-Oxide Gas	Method 8.
Nitro-Muriatic Acid	Method 3.
Nux Vomica	Methods 1 and 8. Inhalation of chloroform.
Oil, Pennyroyal	Method 1.
Oil, Savine	Method 9.
Oil, Tansy	Method 9.
Oil, Vitriol	Method 3.
Oleander	Method 9.
Opium and its comp'ds	Method 5.
Oxalic Acid	Give pulverized plaster or chalk, or sweetened lime-water, and milk.
Paris Green	Method 6.
Peach pits	Method 9.
Pearlash	Method 2.
Potato Balls	Method 9.
Potato Sprouts	Method 9
Phosphorus	Method 1 and skim-milk. Do not give oil.
Poke	Method 5,
Potash	Method 2.
Potash, Bitartrate of	Method 1.
Potash, Bichromate of	Method 4. Also give chalk or magnesia.
Potash, Cyanide of	Method 8 (See Cyanide of Potash).
Potash, Nitrate of	Method 1.
Potash, Sulphate of	Method 1.
Prussic Acid	Method 8. Inhale ammonia and chlorine from moist chloride of lime.
Pulsatilla	Method 5.
Quicklime	Method 2.
Rhubarb	Method 1.
Red Precipitate	Method 4.
Savine	Method 9.
Silver Nitrate of	Method 4.
Soothing Syrups	Method 5.
Soda Caustic	Method 2.
Spigelia	Method 5.
Stramonium	Method 5.
Strychnia	Methods 1 and 8, inhalation of chloroform.
Sugar of Lead	Method 4, Glauber's or Epsom salts in tablespoonful doses in milk.
Sulphate of Copper	Method 4.
Sulphate of Iron	Method 1, magnesia and tea.
Sulphate of Zinc	Warm-water emetic, plenty of milk.
Sulphureted Hydrogen	Method 8.
Sulphuric Acid	Method 3.
Sulphurous Acid Gas	Method 8.
Tartaric Acid	Method 3.
Tartar Emetic	Method 7.
Thorn-apple	Method 5.
Tin, compounds of.	Method 1.
Toadstools	Method 9.
Tobacco	Method 9.
Veratrum	Method 7.
Verdigris	Method 4
Vermilion	Method 4.
White Lead	Method 4. Glauber's or Epsom salts in tablespoonful doses in milk.
Water Hemlock,	Method 5.
White Vitriol,	Warm water emetic, milk.
White Precipitate	Method 4.
Wolf's-bane	Method 5.
Yew	Method 9.
Zinc, Chloride of	Method 1.

SURGERY.

ABSCESS.

Suppuration, or the formation of pus, is one of the results of inflammation. Pus, or matter, is generally supposed to be composed of foul elements from the blood; but it has been shown by careful microscopical examination that pure pus is chiefly made up of corpuscles or globules, so closely resembling the white globules of the blood as to be almost indistinguishable from them. There is some discussion among pathologists as to the source of these corpuscles, some claiming that they are really white blood corpuscles which have left the blood-vessels, while others claim that they are formed in the tissues where the pus is produced. Recent investigations on the subject seem to show that both views are in a measure correct, both the blood and the tissues contributing to the formation of pus.

Pus may be formed upon an open surface, as in the suppuration of a wound, or it may be confined in a cavity in the tissues. The accumulation of pus in the tissues is termed an *abscess*. When such an accumulation is the result of acute inflammation, it is termed an acute abscess. The occurrence of suppuration in an inflamed part is generally indicated by a marked increase of pain and fever. The pain is generally described as heavy. When the abscess is near the surface, the swelling becomes pointed, and feels soft under the finger. By degrees, the outer wall of the abscess becomes thinner, until finally the red color disappears and little blisters are seen just beneath the surface of the skin, which mark the point at which the opening is usually formed, being at first a small, round hole which is soon considerably enlarged by ulceration. In some cases abscess, or formation of pus, is indicated by a chill, or several chills in succession. This is especially the case in abscess of the liver, kidneys, and ovaries. Abscesses in internal organs are also often accompanied by profuse sweats.

Treatment.—There is a natural tendency in pus to work toward the surface. The general system is usually protected from the absorption of pus by a wise provision of nature in surrounding the pur-

ulent matter with a wall of resistance which prevents its absorption. When an abscess occurs near the surface, it should be treated by hot fomentations or poultices, and may generally be allowed to open and discharge by the natural process unless it is so situated that an objectionable scar would result. Large abscesses should be opened freely with the scalpel (Fig. 388), bistoury (Fig. 389), or lancet.

Chronic abscesses are sometimes difficult to cure, the discharge continuing notwithstanding treatment. In these cases, it is necessary to wash out the cavity of the abscess daily with a disinfectant lotion. Peroxide of hydrogen and hydrozone, one part to four or five of water, are valuable remedies in the treatment of abscess.

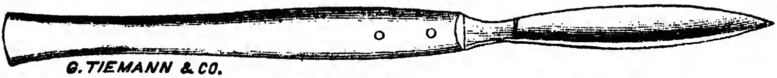


Fig. 388.

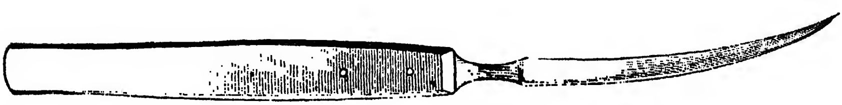


Fig. 389.

Packing the cavity of the abscess with iodoform or sulphur gauze promotes healing, by destroying germs and assisting drainage.

BOILS—FURUNCLES.

Boils are due to infection by pus-producing germs. These germs are constantly found upon the skin. When they get beneath the skin, they produce suppuration and boils or carbuncles. The boil first appears as a red and somewhat painful nodule in the skin, about the size of a bean or pea. Very soon a white point forms at the apex, swelling spreads about the center, usually attaining about the size of a dollar. At the end of four or five days, the central portion, marked by a white point, becomes loosened, and a discharge occurs consisting of a plug, or core, together with matter, blood, and fragments of dead tissue. The suppuration generally ceases in three or four days.

Treatment.—Boils may often be cut short if treated early by continuous applications of ice. Fomentations of the boil with bichloride of mercury solution, one part to 1000, is an excellent means of re-

lieving pain, checking the growth of the boil, and disinfecting the tissues so as to prevent the formation of other boils. The application of heat also aids the natural process by which the boil is cured. When there is a great deal of general irritability, warm full baths are very advantageous.

If the boil does not open promptly, it should be freely lanced, after suppuration has taken place, as shown by softening. Bichloride fomentations may be renewed with advantage after lancing. Blind boils should be lanced, then treated as others. The practice of squeezing boils is a very injurious one, as the matter is thereby dispersed into the surrounding tissues, often producing a numerous crop of boils in the vicinity of the first one. The discharge of matter should be secured by a large opening and gentle pressure.

CARBUNCLES.

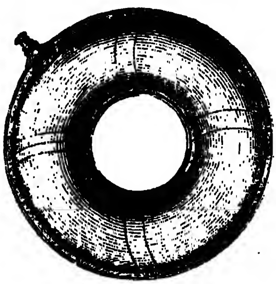
The carbuncle is a sort of compound boil, the several centers of suppuration being joined together. Carbuncles differ from boils, however, in the fact that they have a marked tendency to spread, and generally involve much more of the deeper portions of the connective tissue. Malignant pustule is a bad form of carbuncle communicated to man by infection from animals suffering with *murrain* or *charbon*. This form is quite often fatal. It may be contracted by handling the flesh or hides of animals which have died with the disease.

Treatment.—This affection may be treated after the same plan recommended for boils, but requires greater attention to the general health of the patient, as carbuncles seldom occur except when there is a very low state of the blood. An eminent Dublin physician recommends very highly the application of pressure, by means of strips of adhesive plaster applied over the carbuncle, beginning at the outer margin and covering all except two and a half inches in the center, which is left for the discharge. The strips will be loosened in a day or two, and must be renewed as the swelling decreases. Permanganate of potash, ten to twenty grains to the ounce, should be used when there is a fetid odor. In bad cases the whole carbuncle should be cut out by a surgeon; after which the wound will heal.

BED-SORES.

These are generally produced by pressure from lying too long in one position. The best treatment is the employment of preventive measures, which consist in perfect cleanliness of the parts and daily

rubbing with alcohol, a saturated solution of alum, or alum and tannin, and rubbing the parts with glycerine twice a day after washing. When the bed-sore is formed, cleanse the parts thoroughly and dress antiseptically daily with subnitrate of bismuth or some other antiseptic. An excellent healing application consists of finely powdered iodoform, which should be sprinkled over the surface of the sore. Hot and cold applications should be made daily to parts liable to become the seat of bed-sores, and pressure upon the parts should be prevented by suitable pads or hair pillows. A remedy which has been very highly recommended is galvanic electricity, generated and applied by means of silver and zinc plates. The whole sore should be covered with a thin silver plate, which may be made from a silver dollar by hammering it out thin. In the immediate vicinity, upon the sound tissues, should be placed a zinc plate of about the same size, a single thickness of flannel intervening between the zinc and the skin. The cloth should be kept moistened with vinegar, by the action of which upon the zinc the electric current will be generated. Some observers claim to have seen large sores healed over in twenty-four to forty-eight hours under treatment by this method. By the use of an air cushion (Fig. 390), pressure may be taken off of the affected part, and healing thus facilitated; or a swing may be employed.



DAVIDSON RUBBER CO

Fig. 390.

ULCERS.

An ulcer is a wounded or raw surface which shows no tendency to heal. It generally starts from inflammation. An irritable ulcer is one which is red, sensitive, protrudes, and bleeds freely. The little red points, or granulations, are painful to the touch. A fungous ulcer is one in which the granulations are considerably elevated by exuberant growth, commonly termed proud flesh. Callous ulcers are those which have thick and hardened margins. These ulcers are generally very inactive, are quite deep, and have rounded edges and a glazed surface.

Treatment.—Irritable ulcers should be treated by the application of nitrate of silver, or of a hot iron, by means of which the irritable surface will be destroyed. They should afterward be compressed by means of strips of adhesive plaster. If this treatment cannot be em-

ployed, carbolic acid ointment and other mild ointments should be used. Sprinkling the surface with powdered iodoform will often relieve the pain of irritable ulcers. Iodoform may also be used in the form of an ointment, two to four drams to the ounce of vaseline.

Fungous Ulcers require the application of remedies for the purpose of destroying the fungous granulations. Nitrate of silver or a hot iron may be used for this purpose, or the parts may be washed with a decoction of oak-bark, or dusted with powdered alum. After the proud flesh has been removed, pressure should be applied by means of narrow strips of adhesive plaster.

Callous or *Inactive Ulcers* require remedies to destroy the calloused margins, and to increase the circulation. The hardened edges may be touched with solid nitrate of silver, or the edges may be trimmed or burned with a cautery. To stimulate the circulation, one of the most efficacious remedies is continuous immersion of the part in warm water. The same effect, to a considerable degree, may be obtained by the employment of the alternate hot and cold spray, two or three times a day. Hot fomentations may also be advantageously employed. The use of electricity is frequently followed by excellent results. The application may be made in the usual way, by means of sponges, or by the simple method recommended for bed-sores.

Large ulcers which are in a healthy condition for healing, large surfaces which have been deprived of the skin by accident, as burns, etc., afford a good opportunity for the employment of *skin grafting*, which consists in applying to the granulations small portions of healthy skin taken from some other parts of the body or from some other individual. The grafts of skin should be very small, and care should be taken to place them upon the raw surface with the proper side downward. After the application, the entire part should be carefully covered with gutta-percha tissue, which should be kept in place without removal for two or three days. Great care should be taken in dressing that the newly formed portions of skin are not rudely brushed away.

At the end of a week or ten days, little points of the newly forming skin may be seen making their appearance where the grafts were applied. This measure in some cases is very important, as sores so large as to be otherwise incurable may be healed by means of it. By the aid of this remarkable discovery, cases have occurred in which re-

covery has taken place when the whole scalp has been torn off by the hair becoming entangled in machinery, the new scalp being formed by the growth of hundreds of little grafts placed upon the denuded surface.

SYNOVITIS.

This affection consists in an inflammation of the synovial or lining membrane of a joint. It is indicated by enlargement of the affected joint. The disease may occur in either the acute or the chronic form.

Treatment.—In many cases, improvement of the general health by proper hygienic treatment is essential. The best remedies for chronic synovitis are rest, fomentations, alternate hot and cold applications to the joint, hot leg baths, and manipulations of the joint, with inunction. Attention should also be given to the muscles of the affected limb, which are likely to undergo wasting in these diseases. This tendency may be counteracted by the daily employment of massage and general faradization. The eminent Dr. Metzger depends almost wholly upon manipulations of the joint and limb, rubbing upon the sides of the joint about the knee-cap, and from the feet upward, so as to stimulate the circulation and promote absorption. Some form of unguent, as sweet oil, vaseline, lard, or fresh butter, should be used, so as to avoid irritation of the skin and facilitate the manipulation. The various liniments recommended for this disease owe their efficiency almost entirely to the rubbing with which they are applied. The plaster-of-Paris bandage is an excellent means of securing rest to the joint.

In cases in which there is little or no pain, the elastic bandage is very useful for promoting absorption by compression. The bandage should be applied from the foot upward, so that it may not interrupt the circulation in the lower part of the leg. Care should be taken to bend the joint daily, so as to prevent permanent stiffness. If this is done at the same time that traction is being made upon the limb, no pain will be given nor harm done. As soon as the swelling and tenderness are entirely removed, so that there remains only thickening of the tissues about the joint, the patient should be instructed to begin using the limb moderately, increasing the exercise from day to day as he can without exciting inflammation. If the swelling increases slightly by exercise, the joint should be given rest again for a few days, and then the exercise resumed.

GANGRENE.

Gangrene, or death of the tissues, is frequently a very formidable condition, and one which requires prompt and efficient treatment. The danger is not only from extension of the disease, but from absorption of the elements of the dead tissues. In order to prevent infection of the system through absorption, bathe the parts frequently in carbolic acid solution, twenty drops to the ounce, and apply a charcoal poultice. Prof. Frank Hamilton, of New York City, recommends as the most efficacious remedy for gangrene, continuous immersion of the affected part in water as hot as can be borne. When other remedies do not succeed, pure carbolic acid may be applied to the sloughing parts.

Senile Gangrene.—This is a form of gangrene which occurs in elderly persons, and after low fevers, or great loss of blood, in consequence of deficient circulation. It affects most frequently the foot, and generally appears first as a small black or purplish spot upon the inside or end of the great toe, sometimes without pain or sign of inflammation, at other times with slight redness, which gradually extends until the death of the affected parts occurs with separation from the sound tissues, or until a large portion of the body is involved, and the patient dies.

In some cases, the affected part seems to shrivel up until it resembles a piece of dried beef. In a few cases, the beginning of the disease is indicated by an unnatural white and shriveled appearance of the affected part.

If there is much inflammation, apply cool solutions of carbolic acid, a dram to the pint. If the parts are cold, and white or blue, with no evidence of inflammation, apply heat. Prolonged immersion of the affected part in hot water is an excellent remedy.

VARICOSE VEINS.

As elsewhere explained, a varicose condition of the veins is one in which they are enlarged and tortuous. The lower extremities are most often affected.

Treatment.—The difficulty may be readily relieved by the use of the elastic silk stocking or of a rubber bandage. The best means for a radical cure is tying the affected veins at a number of points along their course, with long-continued rest to the limb in an elevated position.

ANEURISM.

This disease consists of the dilatation of a blood-vessel. It may affect arteries in any part of the body. It very frequently occurs in arteries in the interior of the body, in which case little can be done for it in the line of treatment, except what has been recommended elsewhere. See page 1055. When the affected arteries are near the surface of the body, prolonged pressure with the finger upon the artery affected, above the point at which the tumor exists, and ligation of the affected artery, are the most useful measures. A person suffering with aneurism should be prepared to act with promptness, in case of bursting in the sac. Upon the occurrence of such an accident, a pad should be applied over the point of rupture and tightly compressed with a bandage.

NÆVUS.

This abnormal growth consists of enlarged and greatly dilated capillaries. When near the surface, they are of a dark cherry color; when more deeply seated, of a steel-blue color. They often exist from birth, and hence are sometimes improperly termed mother's marks.

Treatment.—Use mild measures first, such as continuous pressure by means of a coin inclosed in a bandage, and vaccination. If these measures do not succeed, pass red-hot needles under the growth at several points, for the purpose of exciting inflammation. The ligature may be employed. We have obtained the most satisfactory results by the use of galvanic electricity in the form known as electrolysis.

VASCULAR GROWTHS.

These are most likely to occur near the mouth of the female urethra, where they appear as little red prominences of an exceedingly painful character, occasioning very great pain at the time of urination or soon after. We have treated many of these cases with entire success by means of galvanic electricity.

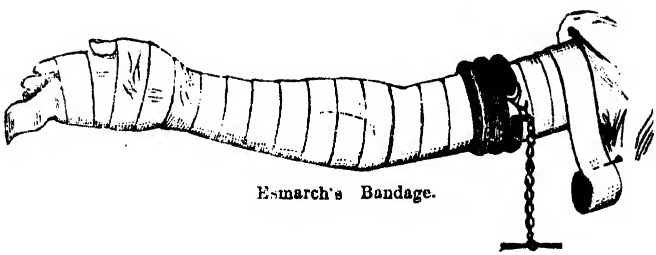
ENLARGEMENT OF THE LYMPHATIC GLANDS.

Enlargement of the lymphatic glands of the neck and armpits is generally due to scrofula. The application of plasters, tincture of iodine, and various irritants, greatly aggravate the local inflammation, and probably do no good. Dr. Hamilton says: "I have never had any evidence worthy of acceptance that these agents have in a single instance dispersed these swellings." We protest that the application of tincture of

iodine to an inflamed gland to amuse the patient until nature effects a cure, is an act of cruelty. The most proper treatment is the application of fomentations, and lancing as soon as softening occurs. Alternate hot and cold applications will sometimes cause absorption to take place, if continued for a long time.

AMPUTATION.

Amputation is a measure sometimes necessary to preserve life from the consequences of disease or injury; but is justifiable only when it



Esmarch's Bandage.

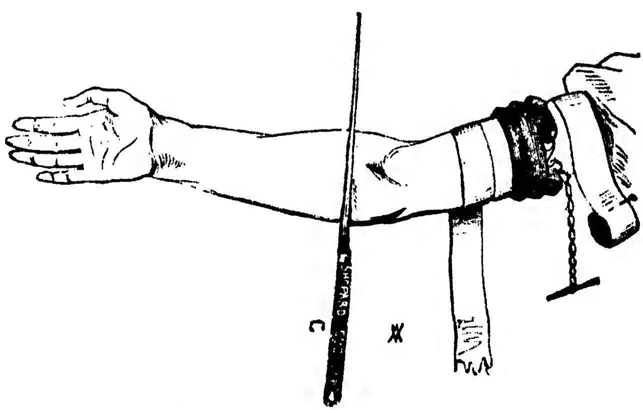


Fig. 391. Amputation of the Arm.

can be clearly settled beyond all reasonable doubt that recovery cannot take place by other means, or that the injury or inconvenience occasioned by the disease or deformity will be greater without the operation than with it. An operation of this kind must of course be left to the experienced surgeon, except in cases of emergency in which a limb has been so badly mangled by machinery or otherwise that it is held to the body by only a few shreds of tissue, which may be readily divided with a pair of scissors.

Operations of this kind were formerly among the most formidable in surgery on account of the severe pain and the great loss of blood attendant upon them; but the discovery of anæsthetics has abolished the necessity for suffering, and by the use of Esmarch's bandage (see Fig. 391), the operation is now an almost bloodless one. In amputating a leg, a short time ago, in which the anæmic condition of the patient made it important that as little blood as possible should be lost, the hemorrhage amounted to scarcely an ounce during the whole operation.

It is needless to give in a work like this directions for the performance of the various forms of amputations required in different portions of the body.

DISEASES OF THE BONES AND JOINTS.

Inflammation of Bone, or White Swelling, may involve simply the periosteum, when it is known as *periostitis.* It occurs most often in young persons. It is accompanied by a chill, high fever, and severe pain in the affected part. There is marked swelling, but no redness. The skin is tense, and usually pits on pressure with the finger. Every jar is painful. When suppuration occurs, the swelling increases, the skin becomes red, and the nearest joint becomes swollen and painful. After ten or twelve days, softening of the part indicates the presence of pus. Periostitis occurring at the end of the thumb or finger is termed a felon. Periostitis often involves inflammation of the bone itself, which also generally occurs in young persons, and is most often the result of injury. The symptoms are intense aching pain at the seat of inflammation, puffy swelling, with an abrupt margin which advances as the disease continues, fever, great restlessness, and, in severe cases, delirium.

It is generally difficult to distinguish between inflammation of the bone and periostitis. The treatment for both forms of inflammation is essentially the same, and consists of applications of ice at the start, with elevation of the affected part. If the disease continues, not being checked by treatment, a surgeon should be called to lance the bone.

Caries of the Bone.—This is an affection of the periosteum, or covering of the bone, which corresponds to an indolent or inactive ulcer of the skin. The tissues of the affected parts are tender and swollen, and the patient suffers with severe boring and tearing pains

at night. Improving the patient's general condition by careful diet and correct hygiene, constitute the means of treatment. Bad cases require a surgical operation for removal of dead bone.

Necrosis of Bone.—Death of bone is generally the result of inflammation. When too large a portion of the bone is not involved, and the periosteum is left intact, nature generally effects a cure by separating the dead from the healthy tissues, and supplying the place of the diseased bone with newly formed tissue. In many cases, an opening to the surface is made, through which the dead bone, gradually undergoing decomposition, is discharged. After complete separation between the dead and the healthy bone has taken place, the dead bone may be removed by a surgical operation.

Excision or Resection of Bones.—Removal of the whole or of a portion of various bones is frequently required in injuries by which their integrity has been destroyed, and after disease which has resulted in death of the bone. The object of the resection is to promote the repair of the diseased or injured part. In case of death of portions of bone, removal is only performed after the dead bone has fully separated from the new. The wise surgeon always endeavors, in the resection of bones, to leave the periosteum of the bone as nearly intact as possible, as by so doing a new formation of bone may occur.

A few years ago, we removed from the thigh of a young man who had been crippled for several years, several inches of dead bone, involving a considerable portion of the shaft of the femur which had undergone decay, or necrosis, and was separated from the healthy bone. The formation of a new bone had already begun, and progressed rapidly after the operation, so that in the course of a few months the young man pronounced his once crippled and diseased leg stronger and more vigorous than the other. We hardly think this was really the case; but the patient was led to his conclusions by the fact that the newly formed bone was larger than the other one, and he did not encounter the slightest inconvenience in its use.

Inflammation of Joints.—Acute inflammation of the joint begins with swelling, heat, and pain, but very slight fever. The joint is distended by a great increase of serum and synovia. The treatment of this form of disease is simply rest, and the application of fomentations three or four times a day, with tepid compresses the balance of the time. Recovery generally takes place quite rapidly.

Chronic inflammation of a joint may result from the acute form, or may be chronic from the start. The joint is much swollen without either heat or pain. It most commonly affects the knee. The patient can generally walk quite easily, but exercise is fatiguing and increases the swelling. This is the so-called white swelling of the knee-joint. (For treatment see "Synovitis," page 1451.)

Anchylosis—Stiff Joint.—Stiffness of a joint may be either true or false. In the first condition, the mobility of the joint is destroyed by a bony union of the articulating bones. In false anchylosis, the stiffness is due to the formation of fibrous bodies between the bones of the joint, to the contraction of ligaments, muscles, or tendons, or

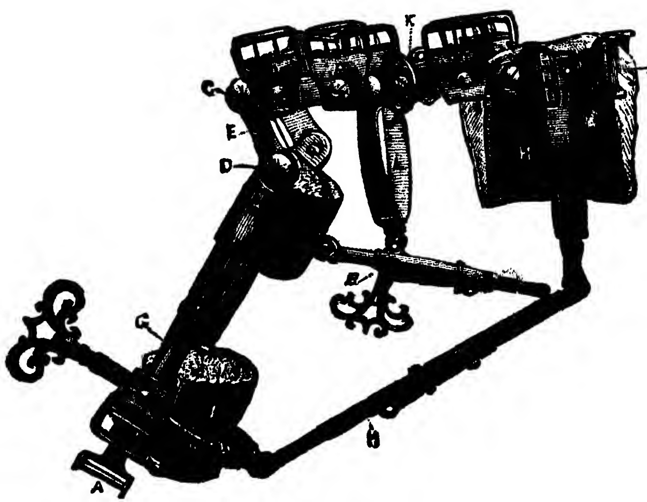


Fig. 392.

their adhesion together or to adjacent tissues, and various other causes.

Treatment.—Bony anchylosis is incurable. In some cases, however, the difficulty may be greatly relieved by a surgical operation by means of which a new joint may be formed. This has been effected in the hip joint by removal of the end of the femur, or of a portion of the bone near the end, and, in case of the elbow and the knee joints, by the removal of the ends of the articulating bones. By keeping up passive motion after the operation, the ends of the bones are prevented from uniting, and thus an artificial joint is produced by a process which sometimes occurs in fractures when bones fail to unite. False

anchylosis, may in mild cases be relieved by fomentations, manipulation, and passive movements of the stiffened joints. Sometimes considerable force is required to overcome the rigidity of the joints. Various forms of apparatus have been constructed for the purpose of applying the necessary force. One of the most efficient of these is shown in Fig. 392. Another form of apparatus for the same purpose is shown in Fig. 393.

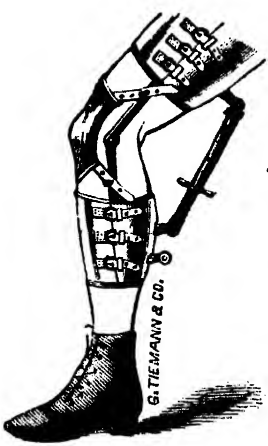


Fig. 393.

Floating Cartilage.—This is a term applied to loose and floating bodies in the joint which are sometimes of a cartilaginous nature. The presence of these bodies is indicated by sudden loss of muscular power in the limb, or inability to support the body, generally accompanied by a sharp pain. On moving the joint freely in one direction or another, the pain and disability suddenly disappear, leaving only a slight soreness. The floating body can generally be felt upon one side just below the knee-pan. Inflammation of the joint is sometimes set up by the irritation of these bodies.

Treatment.—The patient should give the affected joint rest in the horizontal position for some days, and should use the limb carefully when walking, always taking especial care to avoid such motions or positions as are likely to excite the unpleasant symptoms. Patients are sometimes much benefited by using the elastic knee-cap, or a leather splint applied to the joint. In case none of these simple measures give relief, a surgical operation for removal of the foreign body may become necessary. With antiseptic precautions a good surgeon is able to do the operation without the risk which formerly attended it.

Hip-Joint Disease.—This is one of the most important affections of the joints, and its symptoms should be understood by all, as the disease frequently begins quite insidiously There is a difference of opinion among surgeons as to the cause of this affection, some attributing it chiefly to scrofula, while others, particularly the eminent Prof. L. A. Sayre of New York, insist that it is chiefly due to injury of some kind. The usual symptoms are, drawing up of the leg, wasting of the muscles, and pain in the region of the knee. The patient frequently cries out in the night from pain of the limb. As the disease progresses, the thigh

becomes rolled outward, the child limps as he walks, and stands with one heel raised from the ground and the toe turned out. If examined when stripped, it will be noticed that the fold beneath the buttock is higher upon the affected side than upon the opposite. As the disease advances, the limb becomes still more drawn up and the hip-joint stiff. Although for several months, at first, the patient may be able to run about freely, he now becomes able to use the limb much less, or not at

Fig. 394.

all. If he be laid upon a table or other hard, flat surface, being stripped for the purpose, it will be noticed that the body curves upward and the affected limb is slightly bent, as may be seen in Fig. 394.

If now the affected limb be raised, as shown in Fig. 395, the curve in the back disappears. If the same thing is done with the sound limb, no change will be made in the curve of the body. If both limbs are bent

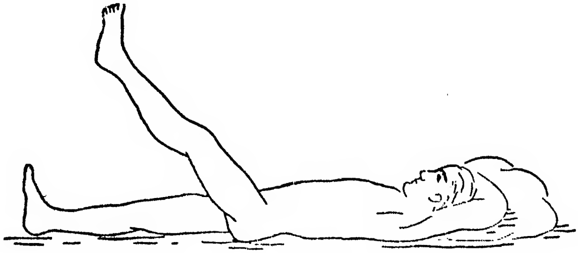


Fig. 395.

and moved from side to side, or otherwise, together, it will be seen that the pelvis, although a part of the trunk, moves with the limbs. Even when the pelvis is held firmly by an assistant, it will be found to move whenever the affected limb is moved, showing that the joint has become stiff, or that anchylosis has taken place. The buttock of the affected side will be found to be somewhat flattened on account of the filling up of the hollow observable in the sound hip. If a slight blow is made upon the sole of the foot when the limb is extended, pain will be felt.

Treatment.—The proper treatment of this disease consists in removing the pressure from the affected surfaces by extension of the limb, or

drawing the affected bone partly out of its socket. This may be done either by confining the patient in bed and attaching a weight to the leg of the affected side by means of a pulley and adhesive straps, as in cases of fracture of the thigh, Fig. 373, or by the use of an instrument known as the hip splint, Fig. 396. The splint is much to be preferred to extension by the weight and pulley, as the latter measure necessitates confinement in bed for a long time, and, in consequence, injury to the general health. The pulley should be removed at night, and alternate hot and cold applications should be made over and about the affected hip. Special attention should be given to improvement of the general health by exposure to fresh air and sunshine, by good diet, etc. The treatment of hip-joint disease should always be conducted under the care of a skill-

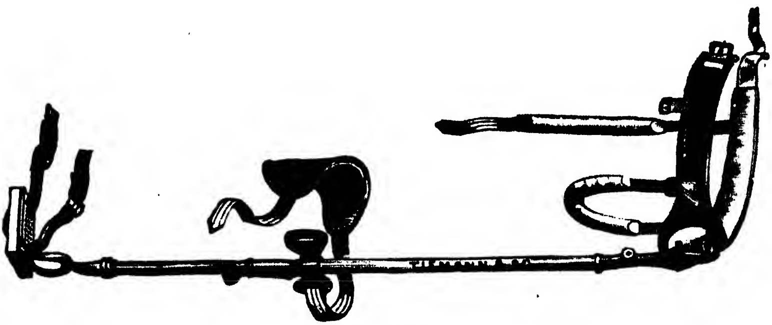


Fig. 396.

ful surgeon. If it is detected early, an entire cure may take place ; but when the disease is considerably advanced, more or less deformity will always remain. In many cases the best that can be hoped for is recovery with a stiff joint. Shortening of the limb takes place in nearly all cases. A surgical operation is sometimes required.

Caries of the Knee and Ankle Joints.—The disease usually causes but slight symptoms for several months, such as jerking of the leg, limping, pain after exercise or on pressure, more or less swelling. These symptoms gradually increase, the limb becoming flexed, and the joints finally stiffened. In the ankle joint, the disease is generally the result of chronic inflammation, which terminates in the formation of abscesses and exposure of the joint. When the knee joint is affected, a steel splint should be applied in such a way that extension of the limb may be produced by which the articulating surfaces will be drawn apart. The plaster-of-Paris bandage is the best treatment for this affection.

The hot and cold spray, tepid pour, and fomentations may also be advantageously employed in treatment.

Angular Curvature of the Spine.—This is the result of caries of the anterior portion of the body of the vertebræ, which allows the vertebræ to come nearer together in front, thus prying the spinal processes apart and producing an unnatural prominence. The disease makes its appearance the most frequently between the ages of four and twelve years. It is indicated by unnatural squareness of the shoulders, stiffness in walking, pain produced on slight jarring, slight tilting backward of the head, unnatural separation of the feet in standing, pains in the stomach or bowels, generally about the navel, and difficulty in bending the trunk in the morning. Upon examination of the spine there will be found in some part of it an unnatural prominence. When the vertebræ of the neck are affected, the head is usually thrown back, the breathing is short and irregular, and often accompanied by a slight sigh or grunt. The patient is also much troubled with hiccough. When the disease is located in the lower part of the back, pain often runs around the pelvis and down the legs. Sometimes there is contraction of some of the muscles of the thigh, in consequence of which one or both limbs may be drawn up. In this case, the patient is generally hollow-backed when standing upon the feet, the spine being strongly curved forward.

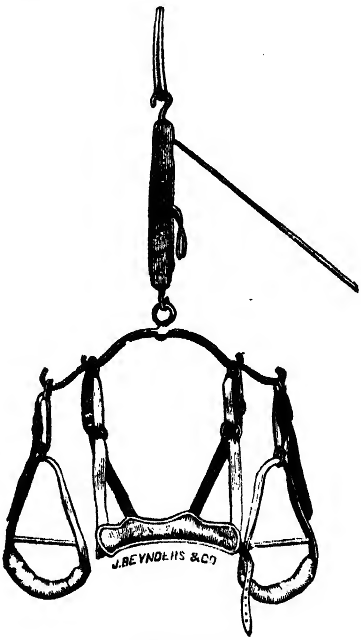


Fig. 397.

Treatment.—The proper treatment of this affection consists in restoring the spine as nearly as possible to its natural condition, and giving it absolute rest in that position. This may be most easily accomplished by a properly adjusted splint or brace. When the disease is in the central or lower portion of the spine, it may be most easily treated by means of the plaster-of-Paris jacket, a method of treatment perfected and chiefly introduced by Dr. L. A. Sayre, professor of Orthopædic

Surgery in Bellevue Hospital College, New York City. In the application of this bandage the patient is suspended by the head and shoulders by means of the harness shown in Fig. 397. The weight of the body thus acts as a force in straightening the curvature while the patient is suspended. In this way, the jacket is applied so that the condition of the spine secured during suspension is maintained, and thus the diseased surfaces are kept apart and an opportunity given for nature to effect a

Fig. 398.

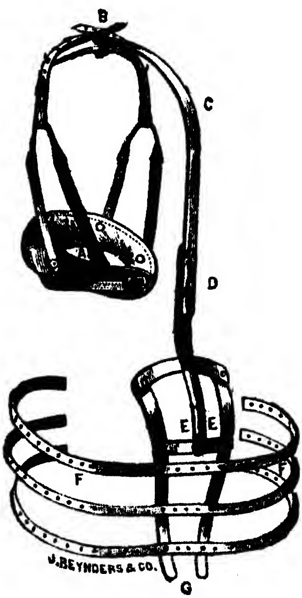


Fig. 399.

cure. Of course the spine cannot be straightened all at once, and it is necessary that the suspension should be frequently practiced, so that by degrees the spine may return to its natural condition.

The wheel carriage, Fig. 398, is a very useful apparatus, by the use of which a patient suffering with disease of the spine may be able to take a considerable amount of exercise in the open air. When the vertebræ of the neck are affected, an apparatus somewhat similar to a "jury-mast" is sometimes required. Fig. 399.

Lateral Curvature of the Spine, as illustrated in Fig. 400, is very much more common than angular curvature of the spine. It occurs most often in girls between the ages of twelve and sixteen. Among the first symptoms are dull, aching pain in the back, especially between the shoulder-blades, a tendency to stoop, lassitude, and general weakness. One shoulder will be observed to be a little lower than the other. Upon a careful examination of the spine it will be found to be curved to one side.

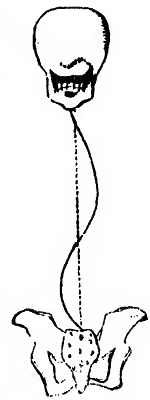


Fig. 400.

Treatment.—Since this disease arises largely through weakness and irregular action of the muscles of the back, it is necessary in treatment not only that the curves should be corrected by proper splints or braces, but that the weakened muscles should be strengthened. In its early stages, the disease can generally be corrected by means of proper exercises, such as swinging by the hands several minutes at a time and several times a day, climbing a ladder hand over hand, exercising with the trapeze, etc. When further advanced, other means become necessary, one of the most efficient of which is the spinal swing, Fig. 401, and the use of proper splints and braces. The plaster-of-Paris jacket is recommended by Prof. Sayre for these cases, and we have employed it in connection with the spinal swing with success in several bad cases. The apparatus shown in Fig. 402 may be sometimes usefully employed in these cases.

Fig. 401.

Hysterical Joints.—Cases of hysteria are occasionally met with in which the principal symptoms are found in the joints, the hip being most likely to be affected. The patient complains of great pain, tenderness and stiffness of the joints,

yet there is no swelling or any other indications of inflammation.

Treatment.—The treatment of this affection consists in the removal of the cause of the nervous disorder of which it is a symptom. Improvement of the general health, and especially the removal of any existing local disease, particularly disorders of the womb in women, is of first importance. Alternate hot and cold applications, and the employment of galvanism, are the best local measures to employ. The patient should be encouraged to make efforts to use the affected limb as much as possible. In some cases, the splint may be used to advantage.

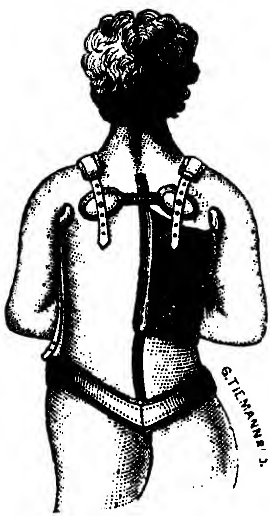


Fig. 402.

Ganglion—Weeping Sinew.—This is an enlargement upon the sheath of a tendon, containing serum or synovia, most frequently found upon the back or the front of the wrist, or upon the top of the foot. An enlargement of this sort most often originates from blows or strains, and hence is most likely to occur in mechanics, gymnasts, laborers, and those who are accustomed to lifting heavy weights. We have seen it in young ladies, in whom it seemed to have been brought on by piano-playing. The enlargements vary in size from that of a pea, to a small hen's egg. The contents consist of a colorless fluid resembling the white of an egg.

Treatment.—Weeping sinew sometimes disappears of itself, but in such cases usually returns. A cure may sometimes be effected by pressure by means of an elastic bandage. The most common method of treatment is rupture of the sac by a blow with a flat stick or the back of a book. The affected part should be given complete rest after an operation of this sort, and a bandage should be worn about the seat of the disease for some time, so as to prevent the sac from refilling.

House-Maid's Knee.—This is a difficulty similar to weeping sinew, consisting of an enlargement of the bursa or sac found between the knee-cap and the skin covering it. Fig. 403. It derives its name from the fact that it occurs very frequently in persons who are accustomed to kneel in the work of scrubbing floors, etc. Weavers are subject to similar enlargements upon the buttocks. Persons engaged in

other occupations suffer with similar difficulties in other parts of the body.

Treatment.—If treated at once upon its first occurrence, this difficulty may generally be cured quite promptly by rest, the application of ice, or the alternate hot and cold spray or pour, and bandaging with flannel or rubber bandage. A cold decoction of oak-bark may also be advantageously employed.

Inflammation of Tendons.—Tendons and their sheaths often become inflamed in consequence of sprains and other injuries. In addition to the local pain, the patient suffers with fever, which is introduced by a chill. When the chills are repeated, there is much danger.

Treatment.—Rest and the application of cold are the most efficient measures. If there is much pain, hot fomentations, or hot packs applied to the whole limb affected, are very efficient. The limbs should also be elevated.

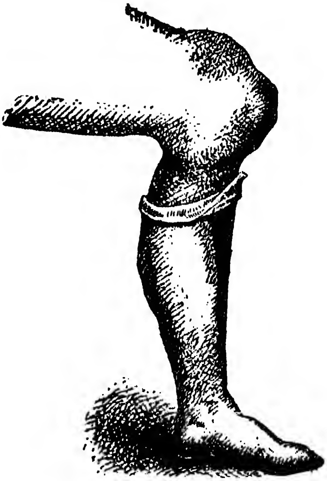


Fig. 403.

Contraction of Tendons, Muscles, etc.—A muscle always contracts during inflammation, and hence in inflammation of the muscles, care should be taken to keep the inflamed muscle extended, and thus prevent contraction. The contraction of tendons is also the result of inflammation or long-continued pressure. The membrane, or fascia, beneath the skin also frequently contracts in consequence of inflammation. Various forms of contraction and deformity often result, which are only relieved by division of the contracted parts. The division should generally be made by a small knife introduced beneath the skin so that an open wound is not made. Sometimes quite a number of incisions are necessary. When small tendons are divided, the extension of the contracted parts should be gradual. In case of large tendons, the parts may be at once forcibly restored to a proper condition and held there by means of splints and bandages. The division of tendons is known as tenotomy.

Contracted muscles also often require division in the same way. Contractions of the skin frequently occur in consequence of deep burns.

This should be prevented as far as possible by holding the parts in proper position and resisting the tendency to contraction. Contractions of of this sort generally soften and become more elastic after a few months. In some cases it is necessary for a surgeon to dissect out the contracted bands, supplying their place with healthy skin from the adjacent parts.

DISEASES OF THE HANDS AND FEET.

A large share of the diseases of these organs results from neglect or abuse. The hands are frequently injured by the use of irritating substances and by exposure to cold while wet or moist. The feet generally suffer most from neglect of proper cleanliness and improper or insufficient covering. Both hands and feet frequently become sources of great discomfort and annoyance for want of proper attention. In cold weather, persons whose hands are liable to chap should avoid the use of soap altogether, cleansing the hands by washing with corn meal or oatmeal and water. The application of glycerine or vaseline after washing is a very excellent means of preventing chapping. The hands may generally be protected from irritating substances by anointing with oil or vaseline before exposure. Cracking the fingers is a bad habit, as it causes enlargement of the joints. Biting the finger-nails is not only disagreeable, but injurious, and is the principal cause of hang-nails of the fingers. The habit when once acquired, is often difficult to break. It may often be accomplished, however, by smearing the ends of the fingers and nails with some bitter or otherwise disagreeable substance, as extract of aloes or tincture of red pepper.

Ag-Nails.—In some persons, the thin layer of skin at the root of the nail has a tendency to adhere to it as the nail grows out. After a time it becomes loosened, and peeling back forms a ragged fringe at the root of the nail, the fissures of which are likely to run down into the skin, thus often becoming very annoying. The best way to prevent this annoying difficulty is to gently press back the portion of skin referred to, every few days, after soaking the hands in warm water, thus preventing it from adhering to the nail.

Hang-Nail of the Finger.—This is a little portion of partially detached tissue adjacent to the nail, which is usually the result of a

slight injury of some kind, and by constant contact with various objects becomes inflamed and quite annoying.

Treatment.—Clean the nail carefully, dry with a bit of absorbent cotton or soft cloth, and apply an adhesive plaster. It should be renewed every day or two until the cure is completed. If a considerable degree of inflammation has been excited, and there is a raw surface of considerable size, a little powdered alum or tannin should be applied before the application of the plaster.

Run-around—Onychia.—This is an inflammation of the matrix of the nail, which results in ulceration of the soft tissues about the nail. It sometimes results from injury. It is more often due to an unhealthy state of the system. The nail gradually becomes loosened, its edges and root roughened and raised up. In the malignant form of the disease, the end of the finger becomes greatly enlarged and bulbous, the nail becomes loosened, and when long-continued, the bone may be enlarged.

Treatment.—The affected part should be thoroughly cleansed and then touched daily with a strong solution of alum or of sulphate of zinc. In severe and obstinate cases, a little powdered alum may be applied to the inflamed tissues with advantage. In very bad cases, the removal of the nail becomes necessary. Special attention should be given to the improvement of the general health by hygienic measures.

Claw-like Nails.—Sometimes through perverted nutrition of the nail, they assume the form of claws. The only treatment is removal of the nail and its matrix.

Felon, or Whitlow.—The most common seat of this affection is the palmar surface or ends of the fingers. The difficulty generally results from some injury. The symptoms are throbbing pain, with tenderness, and hard swelling of the affected part. The skin upon the back side of the finger, particularly around the nail, becomes red and irritated. There are several varieties of felons, some originating in or beneath the tissues of the skin, and others in the periosteum or covering of the bone. The latter variety is the most serious, and sometimes results in destruction of the bone.

Treatment.—As soon as the difficulty is discovered, the hand should be given entire rest and should be carried in a sling, or held in such a position as to diminish the circulation in the limb. The diseased finger should be soaked in water as hot as can be borne. Some

recommend that the finger should be soaked in hot lye. In case the latter remedy is employed, great care should be taken, as we have seen injury to the finger occasioned which was really quite as severe as that which was likely to result from the felon itself, by the injudicious employment of this measure. In some cases, cold gives the most relief; but it is necessary to immerse not only the affected finger, but the whole hand, and as large a portion of the arm as possible. If these measures do not succeed in checking the progress of the disease, the finger should be lanced as early as possible, a free incision being made to the bone. The incision should generally be made by the side of the finger, so that injury may not be done to the tendons. After lancing, a compress moistened with a 1-2500 bichloride of mercury solution should be applied.

Warts are due to excessive growth of the papillæ of the skin. They occur most frequently upon the hands of young persons. They are occasionally seen upon the face. The idea that warts are contagious has little foundation. Warts of the face are likely to degenerate into cancers.

Treatment.—After thoroughly oiling the skin about the wart, touch it with the end of a stick dipped in nitric acid. Acetic acid may also be used for the same purpose. The application should be repeated every few days until the wart is destroyed. Warts sometimes disappear very suddenly, which has given rise to the idea that they may be driven off by various maneuvers supposed to possess the power of dispersing warts in a magical manner. It is possible that in these cases the imagination may be instrumental in effecting a cure.

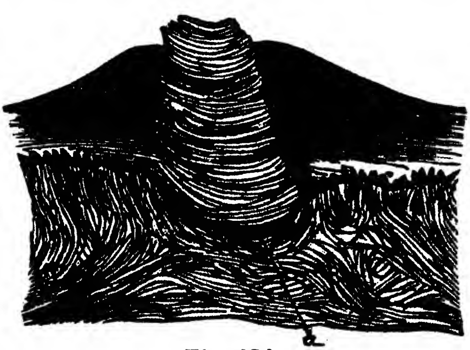


Fig. 404.

Corns.—A corn is a callus produced upon the toes by pressure or friction. Although there are many different varieties of corns, they are generally classified as soft and hard. Soft corns are generally situated between the toes, and arise from pressure of the toes together. The moisture of the skin which is confined by the contact of the toes,

keeps the callus from becoming hard, as would be the case in other situations.

Hard corns are much more common, and are found upon the prominent parts of the toes. Hard corns are generally made up of a number of layers of thickened epidermis, as shown in Fig. 404. When neglected, they may become the source of much pain and inconvenience. The pain is generally of a burning, lancinating character.

Treatment.—The treatment is very simple, but needs to be applied with great perseverance. Soak the feet in hot water once or twice a day, then apply to the center of the corn a little acetic acid with the end of a pine stick. By this means, the hardened skin will be softened, and it may be easily scraped away with a dull knife, or rubbed down with a piece of fine sand-paper or pumice-stone. Prof. Syme, a noted Scotch surgeon, also recommends, in addition to these measures, the application of nitrate of silver over the center of the spot from which the corn has been removed, as a means of preventing its return. When the corn is very hard, it should be covered with a compress wet in a strong solution of soda or saleratus, which should be put on every night until a cure is effected.

In order to prevent its return after removal, the part must be protected from pressure. The best means of doing this is to cover the toe with a piece of soft buckskin saturated with oil, having an opening cut in it the size of the corn,so as to bring the pressure upon the surrounding parts and relieve the diseased portion of skin. This is especially useful in cases in which the tissues have become very sensitive from long pressure. The operation performed by corn doctors for the removal of these troublesome callosities is seldom effective, as the corn is always sure to return. Almost any one can perform the same operation after softening the corn in the manner directed, by seizing the center of the corn with a proper pair of pincers and working carefully between the hard tissues composing the corn and the healthy skin, with a penknife. In applying strong acetic acid or nitrate of silver to corns, care should be taken not to encroach upon the sound skin, and it is a good plan to oil the skin about the corn before making the application, as a means of protection.

Soft corns should be treated by means of astringent applications, as a strong solution of tannin in water or glycerine, a decoction of oak-bark, or a mixture of equal parts of powdered alum and white of egg. It is also important to separate the toes by placing between them a little wad of cotton or lint.

Bunions.—A bunion is an enlargement of a bursa of the foot. It is similar to the affection elsewhere described as a house-maid's knee, the principal difference being that in this case the bursa beneath the great toe is most likely to be affected. The little toe sometimes suffers in the same way. Bunions are also caused by wearing illy fitting shoes, especially narrow toed shoes. Fig. 405 illustrates a foot badly distorted by an improperly fitting shoe, having a large bunion upon the first joint of the great toe.

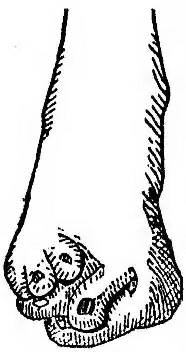


Fig. 405.

Treatment.—The treatment consists in the wearing of shoes which afford plenty of room for the toes, softening of the thickened skin by alkaline washes, and protection from pressure by the same means as suggested for corns. When the toe is very much distorted, it may be drawn into position by means of narrow adhesive strips. A very efficient way of straightening the deformed toe is to place upon it a cot, or some soft material, the free end of which should be attached by means of a strong rubber ribbon to a strip of adhesive plaster applied around the heel, and extending along the side of the foot. In some cases several strips of adhesive plaster are necessary. Fig. 406 illustrates an apparatus which has been constructed for use in these cases.

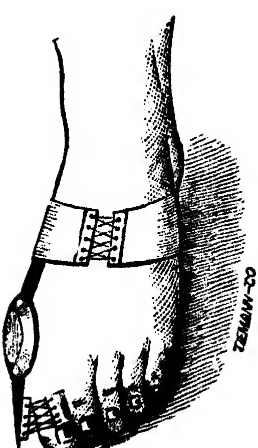


Fig. 406.

Stone Bruises.—This is an affection of the balls of the toes due to slight bruising. Stone bruises most often occur in children who go barefooted. They are characterized by pain, tenderness, and some swelling.

Treatment.—The best treatment is the hot foot bath, or a hot pour or fomentation applied to the bottom of the foot. The last-named remedies are preferable when they can be applied thoroughly, as they enable the foot to be kept in an elevated position.

Cracks or Fissures between the Toes.—These are sometimes very annoying. They generally arise from neglect to cleanse the feet thoroughly, allowing accumulation of acrid perspiration. They heal

readily if the feet are kept properly cleansed. The pain and irritation can be easily relieved by separating the toes by means of a piece of lint or soft cotton, saturated with glycerine or carbolated vaseline. The feet should be bathed a few times with a strong solution of alum, or a decoction of oak-bark should be applied between the toes once a day for a week or two.

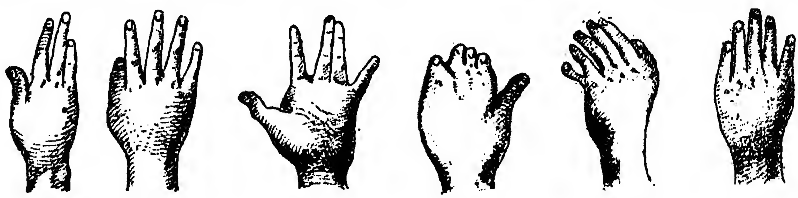
Ingrowing Toe-Nails.—This difficulty generally affects the outer side of the great toe. It is generally produced by wearing narrow-toed shoes or boots, and trimming the nails too closely at the corners. In consequence of the pressure of the shoe, the edge of the nail is forced down into the flesh, producing much pain and irritation, especially in walking. Cutting away the edge of the nail does no good, as it will soon grow out and the difficulty will be aggravated. When the irritation is extreme and kept up for a long time, inflammation and even ulceration may occur.

Fig. 407.

Treatment.—When there is much soreness or inflammation, soak the feet in water as hot as can be borne two or three times a day, and apply cool compresses the rest of the time, giving the feet entire rest. When the inflammation is considerable, subdue it in this way: The center of the nail should be scraped very thin, a notch should be cut in the center at the end, and the edge should be raised by carefully drawing under it threads of floss silk. An ingenious little instrument, Fig. 407, has recently been devised by means of which the edge of the nail may be raised, while the center is depressed. It has been highly recommended by those who have used it. Sometimes the case becomes so bad that removal of the soft parts covering the end of the nail is the only remedy.

DEFORMITIES OF THE HANDS AND FEET.

Deformities of the hands and feet are both natural and acquired. In Figs. 408 to 418 are illustrated a number of different forms of deformity, some of which represent hands and feet with a superfluous



408. 409. 410. 411. 412. 413.

414. 415. 416. 417. 418.

Figs. 408 to **418,** Congenital Deformities of the Hands and Feet.

or a deficient number of digits. In cases in which there is a sixth toe or finger, Figs. 412, 414, and 415, the extra digit is generally imperfectly developed. In some cases in which the number of digits is normal, two or more are connected together, as in Figs. 409 and 410, reminding one of the webbed feet of the goose. Extra digits are generally in the way; when this is the case, they should be removed by a surgical operation.

Clubbed Hands is a quite serious deformity, though fortunately rare. Much can be done to straighten the deformed organs by frequently manipulating them in such a way as to bring them into proper shape. In a majority of cases it is necessary to place the patient in the hands of a skillful surgeon.

Club-Foot is a deformity surgically known as *talipes*, of which there are several distinct varieties, as shown in Figs. 419 to 423. Fig. 419 represents a form of the disease known as *talipes equinus*. Fig 420 represents *talipes valgus*, or splay foot. Fig. 421 illustrates *talipes varus*, the most common form of club-foot. Figs. 422 and 423

represent two forms of *talipes calcaneus.* Club-foot generally exists at birth, but is sometimes acquired in childhood. In the majority of cases club-foot requires treatment by a skillful surgeon, but much can be done by the nurse toward obviating these difficulties, if attention is given to the condition of the feet at birth. If they are found to be

Fig. 419. Talipes Equinus.

Fig. 420. Talipes Valgus.

deformed as shown in Fig. 421, which is the most common of all the deformities of the feet, the nurse should take pains to turn the feet gently into a proper position by pressure of the hand. This should be done several times a day, and if persevering efforts are made in this direction a cure may often be effected. When the condition becomes

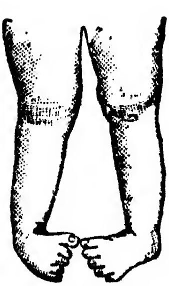


Fig. 421. Talipes Varus.

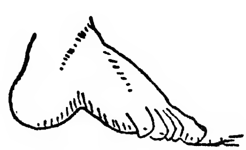


Fig. 422. Talipes Calcaneus.

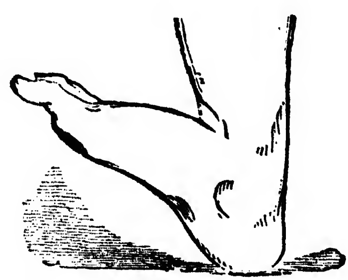


Fig. 423. Talipes Calcaneus.

established by long continuance, it is often necessary to employ some form of apparatus in treatment. Figs. 424 and 425 represent shoes and braces intended to be worn in certain forms of club-foot.

Flat-Foot.—This condition is similar to splay foot. It consists in a loss of the arch of the foot. Persons suffering in this way have a very

low instep. The difficulty is occasioned by relaxation of the ligaments of the foot. The principal inconvenience occasioned is pain upon walking or standing long upon the feet.

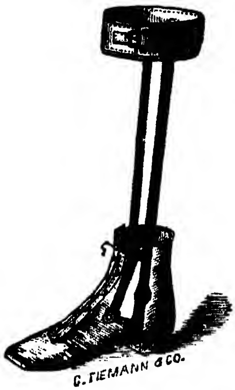


Fig. 424. Shoe for Talipes Calcaneus.

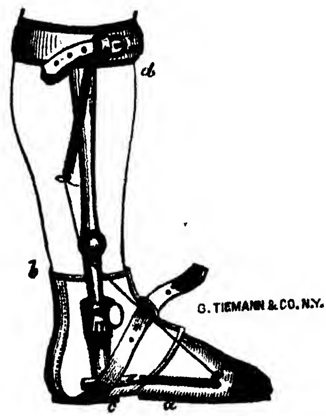


Fig. 425. Shoe for Talipes Varus.

Treatment.—The arch of the foot should be supported by a properly constructed pad placed underneath it. The pad may be composed

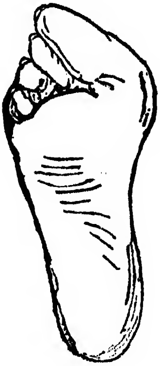
Fig. 426. Outline of Sole of Normal Foot.

Fig. 427. Sole of Normal Foot, also showing relative size of a fashionably toed shoe.

Fig. 428. Effect of Wearing Narrow-toed Shoe.

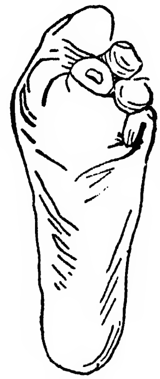
of cotton, rubber, or cork, placed beneath the instep in the shoe, or by means of adhesive strips and elastic tubes attached to the instep in such a way as to support it by traction, as a properly shaped steel insole.

Deformities of the Feet from Improperly Made Shoes.—The hands do not often become deformed to any great extent, unless in consequence of some serious accident or long-continued disease, as rheumatism or paralysis. But the contrary of this is true of the feet. In



429.

430.



431.

Figs. 429 to 431. Deformed Feet from Improperly Made Shoes.

fact it is almost impossible to find a properly shaped foot in any individual who has ever worn shoes or boots. Figs. 426 and 427 represent the outline of the sole of a healthy foot. In Fig. 427 may

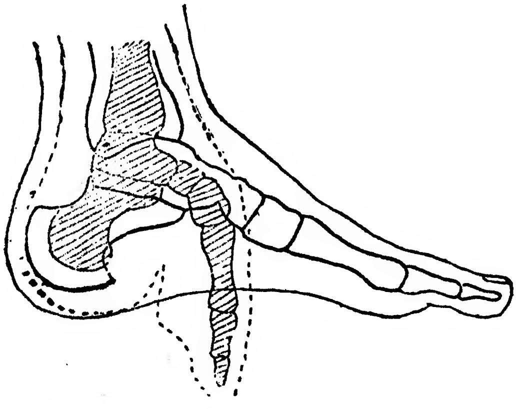
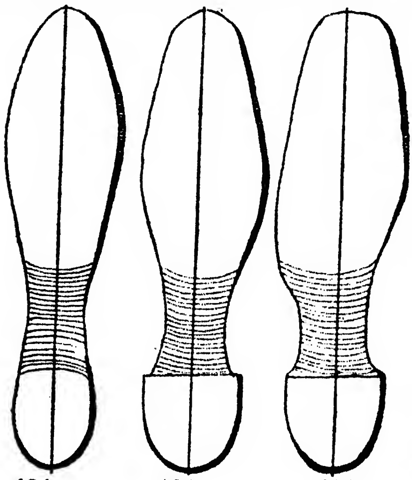


Fig. 432. Deformity of Chinese Woman's Foot, produced by bandaging.

Fig. 433. Outline of Sole of Chinese Woman's Foot.

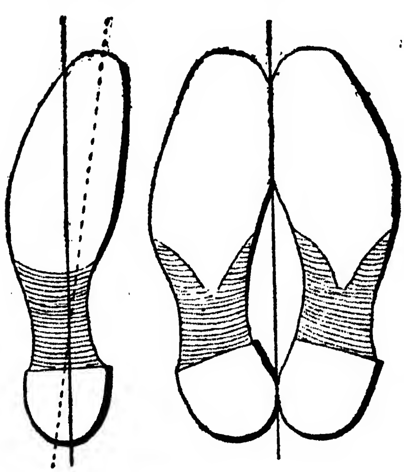
also be seen in dotted lines the outline of a narrow square-toed shoe. As will be readily seen, it is impossible for a well formed foot to be crowded into such a narrow space without injury. The character of

the injury inflicted upon the foot is shown in Figs. 428, 429, and 430, which illustrate similar deformities greatly increased by wearing improperly made shoes for a long time. Fig. 431 also illustrates the same. Not very much worse are the deformities produced by the absurd custom in vogue in China, of bandaging the feet, illustrated in Figs. 432 and 433. Figs. 434, 435, and 436 illustrate improperly constructed shoes, which are very certain to produce diseases of the feet, if worn any great length of time. In Figs. 437 and 438 is illustrated a form of shoe recommended by Prof. Meyer, the most scientific and reliable writer on this subject. Although shoes made after this style could not be said to be particularly beautiful, they will certainly be much better adapted to the shape of the feet, and hence much more conducive to the comfort and health of the feet, than any style of shoes fashionable at the present day.



434. 435. 436.

Figs. 434 to 436. Outlines of Improperly Made Shoes.



437. 438.

Figs. 437 and 438. Outline of Soles of Prof. Meyer's Shoe.

Weak Ankles.—This is a condition most often found in children. It may be the result of hereditary weakness, or of acquired disease, as infantile paralysis. Such cases require the employment of a properly made shoe, such as is illustrated in Fig. 439. The weak joint should be treated locally with electricity, the hot and cold pour, and daily rubbing.

Bow-legs, or Bandy-legs.—This a deformity in which the legs are bowed outward, as shown

in Fig. 440, which also illustrates an excellent form of brace to be worn in these cases. By the application of the brace very early in life, the difficulty may be overcome. Surgical operations have also been devised for the purpose, but these should not be resorted to when the difficulty can be cured by means of a properly adjusted brace. The principal cause of bow-legs is encouraging children to learn to walk before their limbs are sufficiently strong to sustain the weight of the body without injury.

Fig. 439. Shoe and Brace for Weak Ankle.

Fig. 440. Brace for Bandy Leg.

Knock-knee, or Genu-Valgum.—This is a condition in which the legs are bent inward so that the knees interfere with each other in walking. It occurs in consequence of weakness of the ligaments or muscles about the knee. It sometimes occurs in consequence of strains. In some cases of children it becomes so bad that the patient cannot walk without crutches. Children suffering with this difficulty are generally poorly nourished, and hence supplying hygienic conditions is one of the most important elements of treatment. It is generally necessary, in addition, to support the weak limb by means of a splint placed at the back of the joint and over the outer side of the limb. The bandage should be applied in such a way as to correct the deformity as much as possible, the limb being by degrees restored to its natural condition. Very bad cases require specially constructed apparatus, such as is shown in Fig. 441.

Short-Leg.—This may be a natural or an acquired deformity When the degree of shortness is not very great, the difficulty of walking may be relieved to a very considerable extent, and distortion of the body prevented, by an addition to the sole of the shoe worn upon the

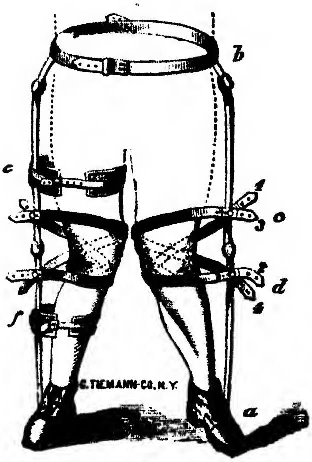


Fig. 441. Brace for Knock-knee.

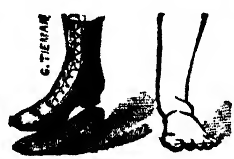


Fig. 442. Extension for Short Leg.

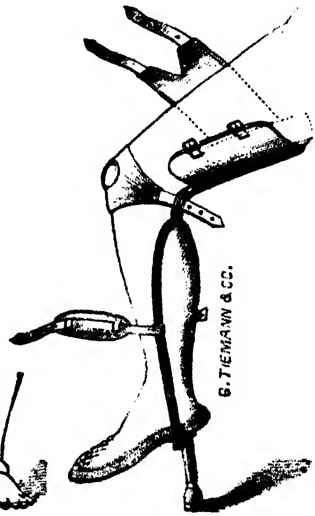


Fig. 443. Apparatus for Short Leg.

foot of the shorter limb, as shown in Fig. 442. In cases in which there is a great degree of shortening, an instrument similar to that in Fig 443 is sometimes required.

DISEASES OF THE EYE.

The eye is one of the most delicate of all the organs of the body, and in consequence of improper treatment is very often the seat of serious disease. Owing to its delicate structure, and the great variety of affections to which it is subject, the majority of eye diseases require for their successful treatment the services of a physician who has given special attention to the treatment of this class of maladies. When such services cannot be secured, and the patient is obliged to do the best he can for himself, it is much safer to do nothing, or, at any rate, to adopt only such measures as are naturally suggested by the morbid condition of the patient, than to adopt active measures which may be more potent for harm than for good.

We shall call attention in this section to a few of the more common affections of the eye, especially to such as are capable of benefit by home treatment.

Congestion of the Conjunctiva, or Mucous Membrane of the Eye.—This is generally the result of exposing the eyes to the irritation of a strong wind, smoke, or dust. It is also occasioned by long-continued use of the eye in viewing small objects, as in reading, using the microscope, or engraving. Employing the eyes in small work by a strong artificial light is especially injurious. Congestion of the eyes occasions a sensation of smarting and itching in the eye, with heaviness and weight in the eyelids. The white of the eye is reddened, the blood-vessels being swollen so as to be visible. The symptoms are generally worse when exposed to a strong artificial light. The eyes are often watery. Congestion is distinguished from inflammation by the fact that it is not attended by any other than a watery discharge.

Treatment.—The eyelids should have rest, and the eye should be bathed with tepid water several times a day. The eye douche is a very useful method of treatment, but cold water should not be employed, as it always does the eyes harm, contrary to the popular notion that bathing the eyes in cold water is a means of strengthening them. This is not an infrequent cause of congestion. In case there is considerable heat in the eye, a thin, tepid compress should be placed upon it and changed every few minutes. With this treatment the majority of cases will recover in a short time. After the disease becomes chronic, it may be necessary to apply a mild astringent, such as a solution of sulphate of zinc, half a grain or a grain to the ounce of water. A few drops of this solution should be dropped into the eye once a day. In dropping medicines into the eye, the patient should be instructed to roll the eye upward, and the lower lid should be drawn down so as to form a little pouch, into which the medicine should be dropped. The patient should then be requested to close the lids and roll the eye about, so as to distribute the lotion over the whole mucous membrane. Cool compresses, or tepid bathing of the eye, should be employed after the application of the solution. We have found the tepid spray, and in some cases the hot spray, or hot sponging of the eye, a very excellent method of relieving congestion when other measures do not succeed promptly. Boracic acid, three grains to the ounce of distilled water, is a useful remedy.

Catarrhal Conjunctivitis—Cold in the Eye.—Persons suffering with catarrh of the mucous membrane complain that the lids feel as if there were sand in the eye. They are stuck together in the morning, sometimes so firmly that they can scarcely be opened. The white of the eye is greatly congested. The lining of the lids has a red, velvety appearance. Catarrh is the result of severe or long-continued exposure to the same causes mentioned as productive of congestion of the eye. The affection is in many cases attributed to taking cold.

Treatment.—Very little treatment is required if the patient has good care and gives the eyes entire rest. Dust and bright lights should be carefully avoided. When the lids are swollen, the eyes very red and hot, and the secretion of mucus abundant, the spray to the eye or the eye douche should be employed several times a day. Either cold or hot water may be employed for the douche. Thin compresses wet in cold water and changed every few minutes, not being allowed to become warm, should be used. A very excellent way is to have a block of ice and keep the cloths upon the ice. Poultices should never be employed. A very weak solution of sulphate of zinc, or alum, not over two grains to the ounce of either, may be used to advantage in many of these cases, a few drops being put into the eye every day. The edge of the lids should be anointed with vaseline, sweet oil, fresh butter, or some other ointment. Patent eye-waters and other secret remedies for the eye, should, of course, be entirely discarded. The practice of using poultices of tea leaves, alum whey, etc., etc., is to be condemned. If left to themselves, the majority of these cases recover without treatment, but when possible, they should receive careful attention, since the effects are sometimes quite serious. Catarrhal inflammation may be communicated from the patient to well persons, and hence great care should be taken to avoid opportunity for contraction of the disease by other persons.

Purulent Conjunctivitis—Suppurative Inflammation of the Eye.—This disease is also sometimes called contagious inflammation of the eye, as it is clearly a contagious disease. The symptoms are similar to those of the preceding disease, but are greatly intensified. At the beginning, the patient suffers with heat and itching in the eye, as if sand or some other foreign body had gotten into it; the edges of the lids stick together, and little beads of matter collect on the lower edge and at the corners of the lids, and become hardened; the mucous

membrane is very red and much swollen, and the eyelids are red and thickened; the discharge is at first watery, but soon becomes purulent or mattery. The patient now begins to suffer great pain about the eye and adjoining portions of the head; there is sometimes considerable fever; the eye is very sensitive to light; the mucous membrane becomes rough in appearance. This is one of the most dangerous affections of the eye, as the cornea is very likely to become affected by ulceration, which may often perforate the eye, causing a discharge of its contents. The disease generally runs its course in three or four weeks. It sometimes becomes chronic, and lasts months and even years. The causes are the same as those which produce catarrhal ophthalmia. When it breaks out in foundling hospitals, barracks, work-houses, boarding-schools, and similar places, it is likely to extend on account of its contagiousness. It is so common in India and Egypt that it is sometimes called Egyptian ophthalmia. The disease generally shows itself in one to four days from the time of exposure. The supposition that this or any other disease of the eye may be communicated by simply looking at a person suffering with it, is erroneous. It is necessary that little particles of the discharge find their way from the diseased eye to a healthy one in order to communicate it. Communication is often accomplished by means of towels, sponges, etc.; but particles may be carried by the air. It should be generally known that the inflammation of the eyes to which new-born children are subject may produce purulent inflammation of the eye in either children or adults.

Treatment.—The results of this disease depend chiefly upon its intensity. Bad cases are likely to result unfavorably in spite of all that can be done for them. The patient should be confined in a darkened room, and in severe cases should be required to keep his bed. The room should be well ventilated, however, an abundance of fresh air being of great importance. The contagious character of the disease should be borne in mind. A person nursing a patient suffering from it, would do well to protect the eyes by means of large glasses. When the discharge gets into a healthy eye, it should be washed away at once with tepid water.

As soon as the nature of the disease is discovered, the healthy eye should be closed and carefully protected by means of a little pad of cotton covered with adhesive plaster in such a way as to entirely exclude the air. This compress should be removed twice a day, and the eye

carefully washed, great care being taken to avoid communicating the disease to the other eye. When the symptoms of disease occur in the healthy eye, the pad should be left off, and it should be treated the same as the other.

In the treatment of the eye itself, cleanliness is of the greatest importance. The eye should be cleansed every hour or two by means of a syphon syringe, the small ear douche tube being gently placed between the eyelids so that the whole eye may be carefully washed. When this cannot be done, a stream of water should be carefully poured upon the eye while the lids are drawn apart and held up by pressure with the fingers. The water should be of a tepid temperature, and is rendered more soothing by the addition of a little milk. The nurse should take great care to avoid getting any portion of the discharge into her own eyes, which is quite likely to happen in the use of the syringe if special care is not taken. Crusts accumulating about the eye should be removed by soaking with warm water, or water in which soda has been dissolved, in the proportion of a teaspoonful to a pint. A little vaseline or lard should be applied to the edges of the eye two or three times a day.

In very severe attacks, cold or ice compresses should be applied constantly. The best plan of application is to moisten compresses of lint or sheet cotton, of sufficient size to cover the lids, and lay them upon a block of ice until they become cold. One of these should be placed over the eyes, and exchanged for a fresh one as soon as it becomes the least warm. When the inflammation is very high, it is sometimes necessary to change the compresses every five minutes. When the extreme cold becomes disagreeable, simple cool compresses should be employed. If these are still unpleasant, hot fomentations or a hot spray to the eyes should be used several times a day. In addition to these measures, astringent lotions may be applied with advantage. One of the best applications is a teaspoonful of powdered alum to a quart of water, a small quantity of which should be injected between the eyelids with a syringe every half hour during the day, and once in two hours during the night, at first. A surgeon should be employed in all cases of this kind whenever possible.

Inflammation of the Eyes in the Newly Born.—This affection may be either catarrhal or purulent in character, and in this respect may resemble either one of the two last-mentioned diseases. It occurs within a few days, or in some cases not for several weeks, after birth. The chief causes are infection of the child's eyes

with the discharges of the mother, want of cleanliness, and exposure to bright lights and cold winds. The disease is generally much less severe than in purulent conjunctivitis in older persons, but, as previously remarked, it may give rise to the more serious form of the disease in either children or adults.

Treatment.—By proper care, this disease may be prevented. The eyes should be washed immediately after birth, by means of clean sponges, lint, etc., the nurse being careful to cleanse her hands thoroughly before washing the child. Prompt treatment at the beginning of the affection is very important. The method of treatment is essentially the same as that described for the preceding disease. Care should also be taken to cleanse the eyes by an injection of warm water before applying the alum preparation.

Diphtheritic Inflammation of the Eye sometimes occurs in connection with diphtheria in other parts. It is a very dangerous disease, and if at all severe, is likely to result in loss of sight. The treatment is the same as for purulent ophthalmia.

Sympathetic Inflammation of the Eye.—In case of severe injury of an eye, especially through the lodgment of a foreign body in it, causing inflammation and destruction of the sight, there is great danger that the other eye will become affected through sympathy. This danger is so great that it is generally considered best to remove the injured eye by a process known as enucleation of the eyeball. The deformity arising from the operation is easily concealed by means of an artificial eye. Artificial eyes are now made to resemble the genuine in appearance so closely as to be distinguishable only by a close examination. Artificial eyes consist of thin porcelain plates properly curved and colored.

Granular Lids—Trachoma.—This is a condition in which the mucous membrane of the eyelids becomes rough in consequence of the formation of little round prominences, known as granulations. The lids are deep red, and generally have a velvety appearance. The mucous membrane is very much thickened; and in consequence of the constant friction of the rough surface upon the cornea, it is generally congested, often ulcerated, and in bad cases, opaque, occasioning great pain, sensitiveness to light, and even diminution of sight.

This condition is generally the result of neglect of proper treatment of inflammation of the eyes. It is in most cases largely dependent upon disorders of the stomach and liver, or both, which have been

occasioned by improper diet, particularly the use of condiments, fats, and excessive quantities of meat.

Treatment.—The patient must carefully regulate his diet and all his habits of life. The food should be simple, but unstimulating in character. Tea, coffee, tobacco, and condiments should be scrupulously avoided. Fat meats and pastry, and excessive quantities of animal fat, should also be avoided. Attention should be given to the general health, especially to improvement of the digestion and increasing the activity of the liver and skin by eliminative baths. The eye should be kept very clean by bathing in tepid water two or three times a day. It should also be protected from bright lights by wearing a hat with a broad rim or using colored glasses. The best kind of glasses for this purpose, especially in the winter season when the reflection of the sunlight from the snow is often very painful and injurious, is the kind known as "London smoke." An alum wash, consisting of a teaspoonful of powdered alum to the pint of water, or a solution of sulphate of zinc, two grains to the ounce, should be applied to the eyes after careful bathing two or three times a week. The application to the eyes of the hot spray or hot fomentations for five or ten minutes twice a day, will often accomplish much more than astringents or irritants of any sort. Care should be taken, however, not to employ these methods of treatment longer than the time specified, as the congestion and inflammation may be increased. The astringent solution should be applied directly to the affected surface. The mucous membrane of the lower lid may be easily exposed by causing the patient to look upward, while the lid is drawn down by pressing upon the skin just below it. The upper lid, however, must be inverted by means of the fingers. This is best done as follows: Seize the edge of the lid by the thumb and finger of the right hand, and stretch it outward and downward. Then place the end of the fore-finger of the other hand upon the upper surface of the lid just below the eye-brow, pressing somewhat firmly upon the eyeball, and turn up the outer edge of the lid. By a little practice, the lid can be easily folded over. It is often very convenient to be able

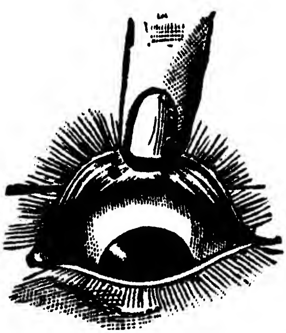


Fig. 444.

to perform this simple operation, as it can be brought into service very often in removing dirt and other foreign bodies from the eye. The operation may also be performed by rolling the lid over a pencil or knitting needle, as shown in Fig. 444. The edges of the lids should be anointed twice a day with vaseline or some other good ointment. A long time will be required in most cases to effect a cure, as the disease is very chronic. The disease rarely if ever recovers of itself, and often requires the services of a very skillful oculist.

Inflammation of the Edges of the Lids.—This affection is indicated by redness of the edges of the lids, and the formation of crusts about the roots of the lashes. It occurs most often in dry, hot weather, and is especially excited by dust. Want of cleanliness, and neglect to use glasses when they are required, are also common causes. It may be the effect of taking cold, or exposure of the eyes to bright light, or using them by intermittent or feeble light. It is not infrequently found as one of the results of scarlet fever or measles. It is of most frequent occurrence in scrofulous children, and in a mild form it is very often met with in consequence of straining the eyes with fine work.

Treatment.—The most scrupulous attention must be given to cleanliness. The eye should be washed three or four times a day with tepid water, or milk and water, or with a weak solution of baking soda, a teaspoonful to the pint of tepid water. When the crusts are very thick, bread and water poultices or fomentations should be applied until they are softened sufficiently to be easily removed. Diseased or stunted eyelashes should be pulled out by means of a pair of forceps. In severe cases, when a considerable portion of the lid is affected, all of the lashes should be pulled out or trimmed close to the lid. It is often necessary to keep the eyelashes pulled out for some time. An alum wash, a teaspoonful to the pint of water, should be applied daily, after thoroughly cleansing with tepid water.

Acne of the Eyelids very often occurs in persons suffering with acne in other parts of the face. It of course affects the edges of the lids, being an inflammation of the sebaceous or hair follicles. The causes are the same as those which produce acne elsewhere, together with exposure of the eyes to cold winds, bright lights, etc. In treatment, the same remedies should be employed as have been recommended for inflammation of the edges of the lids, and in addition, cold compresses should be ap-

plied when the heat and inflammation are considerable, and hot water fomentations when the little pimples have a tendency to suppurate or "come to a head." The diet of the patient should be very carefully regulated as directed in other forms of acne.

Blear Eyes.—This is a condition in which the natural luster of the eye is wanting. It is occasioned by excessive secretion of matter by the meibomian glands, which are excited to abnormal activity by irritation, or inflammation of the edges of the lids, which are usually red and irritable. The term is also applied to a condition in which the natural secretions of the eye are wanting, which is generally the result of long continued inflammation, particularly of chronic granulations.

Treatment.—When due to excessive secretion of fatty matter, from irritation of the lids, the same treatment recommended for the preceding affection should be employed. When due to deficient secretion, the disease is generally incurable, on account of the great changes which take place in the mucous membrane. It may be much relieved, however, by applying a few drops of milk to the eye several times a day, or a little glycerine in the proportion of a teaspoonful to a tablespoonful of soft water.

Stye—Hordeolum.—This is a small boil, which generally has its seat near the margin of the lid. In some cases, the whole eyelid becomes greatly swollen and the eyeball congested. There is generally pain, and the affected part is very tender to the touch. The disease follows the usual course of a boil, and has a great tendency to return repeatedly, so that the patient may not be free from the affection for several months.

Styes are most frequent in persons addicted to habits of dissipation. They often result from disorders of the stomach. Styes often indicate the need of glasses.

Treatment.—Styes, like boils, occasionally disappear without coming to a head, but the most usual result is suppuration and discharge. Absorption without suppuration may be produced in some cases by vigorous application of cold or iced compresses at the beginning of the disease; but as a general rule, the application of hot water fomentations is much to be preferred. When it is evident that pus is formed, the disease may be shortened by lancing with a knife. The fomentations employed, either before or after the boil is opened, should be very small. Injury may be done to the eye by continuous application of large poultices. The edges of the eye should be kept anointed with vaseline, sweet oil,

or some other simple unguent. Attention should be given to the diet and all means for improvement of the general health.

Pterygium.—This is an affection of the eye which frequently arises in consequence of chronic inflammation or congestion of the conjunctiva, although it may also originate independently of any inflammation. It consists of an enlargement of the blood-vessels of the mucous membrane of the eyeball, and appears as a red triangle, the apex of which appears at the edge of the cornea or encroaches upon it, while the base is at one corner of the eye. It often stops when it reaches the edge of the cornea but sometimes extends to the center of the pupil, though never going beyond this point.

Treatment.—The disease does not affect the sight, and does no harm, except as a blemish, unless it encroaches upon the pupil. When small, it may frequently be caused to disappear by applying to the eye an alum wash, a teaspoonful to the pint of water, three or four times a week. When the growth is very large, however, so that it interferes with the sight, it should be removed by a surgical operation, which can only be performed by a competent surgeon.

Tumors of the Eyelids.—Small growths sometimes appear upon the eyelids, particularly near the edge. One form, known as *chalazion*, is due to obstruction of the duct of a meibomian gland in consequence of inflammation, which results in the accumulation of the fatty secretion. These tumors are generally about the size of a pea. They are most manifest on the inner surface of the lid, lying just beneath the mucous membrane. They are most often found in the upper lid. Another form of tumor, known as *milium*, is situated at the edge of the lid. Generally quite a number are found, each about the size of a millet seed. Other tumors, as sebaceous tumors, warts, fatty tumors, fibrous tumors, etc., as well as cancer, are sometimes found upon the eyelids.

Treatment.—All these abnormal growths are best treated by removal by a surgical operation. In many cases, the little white tumors which appear along the edge may be cured by simply pricking with a needle and squeezing out the contents.

Ptosis—Inability to Open the Eye.—This is an affection of the eye in which the upper lid drops down more or less, in some cases to such an extent that the patient is unable to open the eye at all In some cases, this is due to paralysis. In others, it occurs in consequence of great swelling of the upper lid.

Treatment.—The cause must be removed, so far as possible. When due to paralysis, appropriate treatment should be employed, electricity being the chief remedy indicated.

Inability to Close the Eye.—This is a condition which is generally due to paralysis of the orbicularis palpebrarum, or circular muscle of the eye. In consequence of the wide gaping of the eyelids, the patient has a peculiar staring appearance. The eye being constantly exposed to irritation in consequence of dust, etc., there is a constant flow of tears, and, sooner or later, inflammation is produced.

Treatment.—When due to paralysis, electricity should be used, being applied daily by means of small sponge electrodes. The positive pole should be placed upon the forehead just above the eye, while the negative is passed across the eyebrow and beneath the eye. The current should be applied not more than one to three minutes at a time. In some very bad cases, it becomes necessary to attach the lids together by means of stitches.

Deformities of the Eyelids.—Sometimes, in consequence of inflammation or injury to the eyelids, the edges may turn in or out in an unnatural degree, in consequence of which the functions of the eye may be greatly interfered with. When the lids are turned in, the eyelashes rub upon the eyeball and produce irritation; when they turn out, the tears do not escape readily through the natural channels, and a portion of the mucous membrane is exposed to irritating influences.

Treatment.—Since these diseases are usually the result of chronic inflammation of the eyes, they should be prevented by proper treatment of the origin of the disease. When a deformity has been produced, however, a surgical operation is usually necessary to restore the lid to a healthy condition. In cases of entropion, in which the opening between the lids is much narrowed, making the eye look smaller than natural, relief may be obtained by means of an operation known as *canthoplasty,* which consists in extending the opening between the lids by cutting the outer corner with a knife or scissors. We have sometimes afforded patients very great relief from suffering by performing this operation.

Wild Hairs in the Eye.—This is a common term applied to a condition in which the lashes grow in an improper direction or position. In a form of the disease known as *trichiasis,* the lashes are not confined

to the edge of the lid, their proper position, but grow upon the mucous membrane within the edge, being generally very irregular, and often small, pale, and stunted. In another form of the disease known as *districhiasis*, there are two rows of lashes instead of one, the outer being in proper position, while the inner is farther back and turned inward. In consequence of these irregularities of the lashes, the mucous membrane of the eye becomes greatly irritated, the eyes becoming red, watery, and irritable. The patient complains of constant pricking and itching, as if sand or some other foreign body were lodged beneath the lid. Sometimes the cornea becomes inflamed, and sight is impaired.

Treatment.—When the difficulty is not very severe, it may be successfully treated by carefully extracting with a pair of small pincers the offending lashes, repeating the operation as often as necessary. After being pulled off a number of times, the growth is usually checked, and thus a cure is effected. In very bad cases, it sometimes becomes necessary to destroy the hair follicles by passing to the root of each lash a fine needle, dipped in a strong solution of caustic potash. Sometimes electricity is used for the same purpose, the current being passed through a needle, which is inserted at the root of the hair. In extremely bad cases, the mucous membrane containing the offending lashes must be removed by a surgical operation.

Spasm of the Eyelids.—This is a spasmodic affection of the circular muscle of the eye which closes the lids. When severe, the eyelids are pressed so firmly together that the patient cannot open them. Indeed, in some cases the contraction is so strong that the eyelids cannot be drawn open without very great pain. In other cases, there is only temporary twitching or contraction of the lids, which soon disappears. This affection is generally due to irritation of the eye, as in inflammation of the cornea or conjunctiva. It sometimes occurs in connection with neuralgia of the face. The irritation occasioned by foreign bodies in the eye often produces severe spasms.

Treatment.—When due to inflammation or dirt in the eye, the cause must be removed by proper treatment. When occasioned by neuralgia, heat should be applied, together with other remedies for that affection. In cases in which it seems to be independent of these conditions, it may often be removed by pressure of the finger upon the supraorbital nerve. This may be accomplished by pressing with the fin-

94

ger upon a point just above the little notch which may be felt by passing the finger along the eyebrow. Strong pressure just in front of the ear will also sometimes instantly relieve spasm of the eye. Another excellent remedy is holding the face in cold water for some minutes, or the application of ice compresses over the eye.

Nictitation—Twitching of the Eyelids.—This is a convulsive twitching of the eyelids which may be either very slight or severe. The twitchings sometimes follow each other very rapidly. This affection most often occurs in persons of a nervous temperament, and when the eyes are tired from overuse and nervousness. An excited state of the mind will greatly increase the difficulty.

Treatment.—The general health should be improved by proper remedies. If there is any irritation of the lids, the eye douche should be daily used. The application once or twice a day of the hot spray to the eyes with the lids closed, is also a useful remedy.

Adhesion of the Lids.—In some cases, in consequence of injury, especially injuries of the eye from lime, acids, hot iron, etc., the lids become adhered together, or to the eyeball. These difficulties can be overcome only by means of a proper surgical operation.

Epiphora—Watery or Weeping Eye.—This is a condition in which the tears are secreted more rapidly than they can be carried away from the eye by the nasal duct, and hence are allowed to flow over the lids and down the cheek. It may result from excessive secretion of tears, or obstruction of the passage by which the fluids of the eye are conducted to the nasal cavity. Obstruction may be the result of closure of the opening into the lachrymal passages or tear ducts, or to inflammation or stricture of some part of those passages. The starting point of the difficulty is generally inflammation in the corner of the eye next to the nose. It most often accompanies a severe cold in the head, being really an extension of the disease of the nasal cavity to the mucous membrane of that portion of the eye. Sometimes, in consequence of the inflammation, an abscess is formed in the tear sac, which opens and forms a fistula from which the tears may run upon the face. In other cases, there is a catarrhal condition of the mucous membrane lining the tear sac, which causes it to become filled with a mucous secretion. This difficulty is indicated by a little swelling in the corner of the eye, which may be emptied by pressure, the mucus being squeezed out from the edge of the lid, from which it may be wiped away.

Treatment.—Many people suffer on for years with a difficulty of this sort without making any attempt to obtain relief, although the difficulty may in most cases be readily cured by a surgical operation. It is generally necessary to divide the little tear sac, and in many cases, a long-continued course of dilatation of the canal which leads from the eye to the nose, is necessary. This is accomplished by means of delicate probes, Fig. 445, the size of which is gradually increased

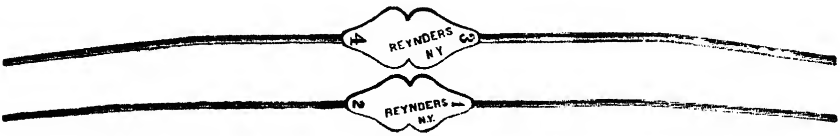


Fig. 445.

as the canal is enlarged. The old method of treating these affections by inserting silver tubes to conduct the tears from the eye to the nasal cavity, is not now employed.

Cross-Eye—Wall-Eye—Squint—Strabismus.—The term cross-eye, or squint, is applied to a condition in which one eye is drawn in toward the nose. When the eye is turned toward the outer corner, the condition is one known as wall-eye. Inward, or converging squint, generally begins in early childhood. The squint is usually the result of long-sightedness, being occasioned by the constant strain necessitated in viewing near objects. At first, this affection is accompanied by double vision; that is, the patient sees two objects where but one exists. After some time, however, but one object is seen, as the squinting eye is not used in viewing objects, in consequence of which the power of sight is gradually lost. The immediate cause of strabismus is the weakening of one or more of the muscles of the eyeball. This may be the result of paralysis of some of the muscles of the eyeball. Squint sometimes appears very suddenly. In such cases, it is generally indicative of disease of the brain, as in meningitis and tumors of the brain.

Treatment.—When due to paralysis, the difficulty may often be relieved by the local application of electricity. The negative pole should be placed over the closed eye, or at the inner side of the nose, the positive being placed upon the forehead just above the eye. In many cases it is necessary to perform an operation upon the eye, which consists in completely or partially dividing the muscle upon the side of the eyeball toward which the eye turns.

Oscillation of the Eyes—Nystagmus.—This affection consists of a peculiar restless movement, or oscillation of the eyeballs. The movement is generally from side to side, but is sometimes rotary. Patients suffering this way are often obliged to read with the print turned in a vertical direction on account of the blurring from the letters running together. The affection is occasioned by a variety of causes, which are, unfortunately, generally of such a character as to render the condition incurable.

Inflammation of the Cornea—Pannus.—This disease is indicated by a congested condition of the cornea, the blood-vessels being visible, great sensitiveness to light, severe pain, and weeping of the eye. Pannus may be occasioned by the irritation of inverted eyelashes, by conjunctivitis, and especially by granular lids.

Treatment.—When due to granular lids, the disease should be treated as elsewhere recommended for that condition. Fomentations and hot spray to the eye are especially serviceable.

Ulcers of the Cornea.—Ulcers of the cornea may generally be seen as little white spots near its margin. There is generally great sensitiveness to light, and severe pain, with congestion of the eye. This is a very serious affection, as penetration of the eye is quite apt to occur. The majority of cases are best treated by means of careful restriction of the diet, perfect rest of the eye in a darkened room, the application of a light bandage over the eye, and the use of the hot fomentation or hot spray three or four times a day half an hour each time. Ulcers of the cornea are very apt to leave behind them white spots.

Opacities of the Cornea.—In addition to opacities, or spots produced by ulcers, the cornea sometimes becomes partially opaque in consequence of inflammation, or pannus. There are also various other forms of opacities.

Treatment.—Very extensive opacities of the cornea sometimes wholly disappear in time without treatment; but in many cases, the most thorough treatment is ineffectual. In order to secure absorption, it is necessary to increase the activity of the circulation in the eye, which may be accomplished by means of astringent solutions—as a weak solution of alum, or tannin one or two grains to the ounce of water, or still better, by means of hot fomentations or the hot spray to the eye. The spray should be used daily for fifteen or twenty minutes.

The spots cannot be removed by an operation, as many people suppose, as they are in the substance of the cornea itself, not "films over the eye," as they are sometimes called. Sometimes, however, when the opacity is immediately over the pupil, so that the sight is greatly interfered with, benefit may often be derived by an operation known as *iridectomy*, by which an artificial pupil is made at one side by cutting an opening through the iris. An ingenious London surgeon some years ago removed the opaque portion of the cornea in a case under his care, and substituted for it a portion of a healthy cornea from the eye of a rabbit. Unfortunately, the new cornea gradually lost its transparency.

Arcus Senilis.—This is the term applied to an affection of the cornea which manifests itself as a silvery rim near the edge of the cornea but separated from the edge by a ring of transparent tissue. It is due to fatty degeneration of the tissue of the cornea, and is considered to be an indication of the beginning of similar changes in other parts of the body, particularly in the blood-vessels of the brain. It is seen most frequently in persons over fifty years of age, though it may occur at an earlier period, especially in persons addicted to the use of alcoholic drinks.

Inflammation of the Iris—Iritis.—This affection is characterized by pain in the eye so severe as to prevent sleep. The pain also extends to the brow and the temples, in consequence of which it is often mistaken for neuralgia. The eye is congested, especially about the cornea. The lids are likely to be swollen and puffy. There is at first a sensation of burning and itching in the eye, but the pain shortly becomes much more severe, being sharp and cutting. The pain is most severe during the night, diminishing toward morning. There is some feverishness, coated tongue, want of appetite, and often nausea and vomiting, so that the affection is sometimes mistaken for a bilious attack. Iritis may also be regarded as a simple cold in the eye at first, an error which may result in loss of the sight by occasioning neglect. A symptom of very great importance is contraction of the pupil. The pupil generally contracts promptly when exposed to a strong light, and dilates when the light is withdrawn. If the pupil is contracted and remains so, whether exposed to strong light or not, or if it moves very slowly, there being at the same time great sensitiveness to light, inflammation of the iris may be very

strongly suspected. An excellent test is to drop into the eye two or three drops of a solution of atropia, two or three grains to the ounce of water. The effect of this treatment is to dilate the pupil. If the pupil is found greatly enlarged fifteen or twenty minutes after the application of the atropia, the iris is probably not affected. The most common causes of iritis are rheumatism and syphilis. It may result from overuse of the eyes, from sympathetic irritation with another eye which has been the seat of injury, or from direct injury.

Treatment.—The great danger in this disease is that the pupil will become permanently contracted through adhesion to the cornea or to the crystalline lens. The best means of preventing this is dilatation with atropia. A drop or two of the solution of atropia mentioned

Fig. 446.

before should be applied to the eye once in five minutes for a half hour at a time, three or four times a day, by means of a medicine dropper, Fig 446, or a camel's hair brush. The lower lid should be turned down and the solution dropped into the pocket formed between the edge and the eyeball. The eye should be carefully protected from light by confining the patient in a dark room if the inflammation is very severe. The well eye, as well as the weak one, should be given perfect rest, as it cannot be used without irritating the other. Hot fomentations or the hot spray, as hot as can be borne, should be applied over the closed eye one hour at a time, from three to six times a day, according to the severity of the case. In some cases, when the pain is very severe, fomentations should be kept up continuously, until the pain is permanently relieved. When the eye has received a severe injury, the application of fomentations is an excellent means of preventing iritis. Wet-sheet packs and vapor baths may often be used with advantage in treating cases of severe inflammation of the eye, being excellent derivative agents.

Persons suffering with chronic iritis should carefully protect the eye from a bright light by means of blue or London smoke glasses, and should avoid taxing the eyes severely in any way. The use of tobacco and alcoholic liquors should be particularly avoided, as also exposure to the irritation of tobacco-smoke.

Dilated Pupils—Mydriasis.—Unnatural dilatation of the pupils is produced by belladonna or atropia, hyoscyamus, stramonium, and other drugs. It may also result from paralysis of one of the nerves of the eye. It is frequently the result of rheumatism or of syphilis. It usually affects one eye, but may involve both. The sight is generally somewhat impaired.

Treatment.—Electricity is a remedy of value in this affection when it is not due to some acute disease of the brain. Benefit may also be derived from frequently closing the eyelids and compressing the eyes as firmly as possible, and also by frequent exercise in reading.

Contraction of the Pupil—Myosis.—This condition of the pupil is produced artificially by poisoning with opium or with calabar bean. The pupil is sometimes contracted to the size of a pin-head, or even less. This condition may also arise from paralysis of one of the nerves of the eye, or from irritation of the third nerve, which supplies the eye. It sometimes results from long use of the eyes in viewing minute objects, as in the study of microscopy, watch-making, reading, etc. It is also a symptom in some affections of the spine, and in inflammation of the brain.

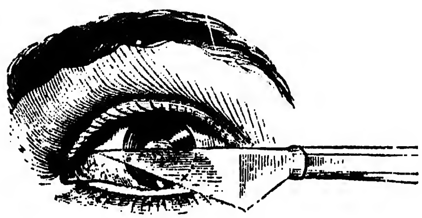


Fig. 447.

Irregular contraction of the pupils, one being large and the other small, is also observed in some cases of cerebral disease. Nothing can be done in these cases except to remove the cause of the affection as far as possible.

Cataract.—This is a disease of the crystalline lens in which it loses its transparency, becoming opaque, so that the entrance of light to the eye is obstructed. When the disease is fully developed, the patient can barely distinguish light from darkness. The pupil loses its natural blackness, the opaque lens being visible behind it. Cataract is sometimes spoken of as being *on* the eye, which is a popular error, as it is within the eyeball. In former times many physicians, as well as the common people, often mistook the white spots, already described as opacities of the cornea, for cataract.

Treatment.—The only treatment is a surgical operation, which consists in removal of the crystalline lens. This is usually done by

making an opening in the eyeball near the edge of the cornea, by means of a cataract knife. Fig. 447. Formerly the lens was punctured by means of a delicate needle passed into the eye, an operation known as "needleing." This plan was adopted particularly in young children. It is now abandoned, however. In the hands of skillful operators, fully four-fifths of those operated upon recover useful sight. It is generally necessary that the patient should wear glasses, two pair being usually required, one for distance, and the other for near objects, as the power of accommodation is of course lost by removal of the lens.

Fig. 448.

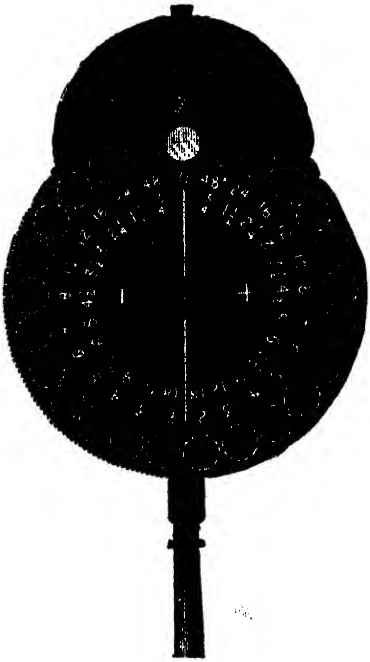


Fig. 449.

Diseases of the Choroid, or Color-Coat of the Eye.—The choroid membrane is a continuation of the iris, and is the colored membrane which lines the back part of the eyeball. It can be recognized only by means of the ophthalmoscope. Figs. 448 and 449.

This instrument consists essentially of a concave mirror with an opening in its center, by means of which light is thrown into the eye of the patient, while the examiner looks into the eye through the small opening in the mirror. By means of this little instrument, the whole

interior of the eye can be readily examined, its various structures being brought clearly into view. Fig. 449 illustrates the most improved form of the apparatus, which is furnished with a set of small lenses, arranged in such a manner as to be capable of being brought opposite the opening in the mirror, thus magnifying the view obtained by the mirror. Little was known respecting the diseases of the interior of the eye before the invention of the ophthalmoscope by Helmholtz, about fifty years ago. Disease of the choroid requires the attention of a skillful oculist.

Diseases of the Retina.—Among the most common causes are the use of tobacco or alcohol, overuse, bad light, injury to the eye, and disease of the kidneys. These are among the most serious of eye disorders, being in many instances incurable. When resulting from the use of tobacco or alcohol, great improvement generally occurs from the disuse of narcotic stimulants of all sorts. The use of electricity is a valuable remedy in many of these cases. There is a peculiar form of disease of the retina in which it becomes covered more or less densely with black spots. A prominent symptom of this disease is night blindness. Patients thus affected are able to get along without difficulty in the daytime, but become partially blind after sundown. There is also a narrowing of the field of the eye, so that objects are seen distinctly only when directly before the center of the pupil. Little can be done for these cases by way of treatment.

Diseases of the Optic Nerve.—When the optic nerve is seriously diseased, a considerable or complete loss of sight is generally the result. It is subject to inflammation, paralysis, and atrophy. The use of tobacco is a very frequent cause of these affections. As a rule, very little improvement can be expected in these cases.

Glaucoma.—This is a very serious disease of the eye, the nature of which is not thoroughly well understood. The eyeball becomes very hard in consequence of an increase of its fluid contents, the result of which is paralysis of the optic nerve in consequence of the severe pressure. When acute, it is generally very painful. The pain is generally accompanied by flashes of light, appearances of rainbow colors, and dimness of vision. The disease should not be mistaken for neuralgia, as it requires very prompt treatment at the hands of a skillful surgeon. It is usually necessary to perform the operation known as iridectomy, an operation described on page 1493.

Specks before the Eye—Muscæ Volitantes.—Many persons are constantly annoyed by various floating objects before the eyes, sometimes described as specks, and again as cobwebs, circles, strings of beads, etc. Sometimes opaque spots of considerable size are present. The small specks, cobweb appearances, etc., are generally due to disturbance of the rays of light by changes in the cell structure of the vitreous humor of the eye. The larger and denser spots are generally due to the presence of small clots, or rather opaque bodies in the vitreous humor. These can be readily seen by examination of the eye by the ophthalmoscope. Cases have been met with in which the embryo of the tape-worm, or the cysticercus, was found in the humors of the eye. Persons whose eyes are healthy, are often annoyed with floating specks. As a general thing, they need not give serious alarm. They are by some considered as an indication of an inactive state of the liver, and in some cases, of disease of the womb. The spots can generally be seen quite readily by persons troubled with them, by looking at a white surface through a pin-hole opening in a card. A bright light covered by a ground-glass shade is a good object to look at. These little objects sometimes become quite an annoyance. An eminent German microscopist has been obliged to make a map of the opacities in his eyes, for use in correcting the observations which he makes with the microscope.

Treatment.—The most that can be done is to improve the general health of the patient. In case the liver is inactive, fomentations should be applied over the organ daily, and the abdominal bandage should be worn at night. Condiments, butter, fat meats, tea or coffee, tobacco, and alcoholic liquors should be carefully avoided. In some cases, benefit may be derived by the application of fomentations and of electricity to the eye.

Amaurosis.—This malady has been described as a disease in which the patient sees nothing and the physician sees nothing. This remark was made before the discovery of the ophthalmoscope, and when the term was applied to a large number of conditions of the eye which were not understood. It is now applied to a gradually increasing paralysis of the optic nerve, or to blindness resulting from disease of the brain. A form of the disease known as tobacco amaurosis is frequently met with in smokers. Indeed, the use of tobacco and of alcoholic liquors is the most frequent of all causes of this disease. So

many cases have been reported in the last few years in which the sight has been nearly or quite ruined by the use of tobacco that all oculists now condemn it as an exceedingly harmful drug.

Treatment.—When due to disease of the brain, or paralysis of the optic nerve, a cure is impossible in many cases. Electricity is one of the most useful remedies. Tobacco amaurosis cannot be cured unless the patient renounces the use of the weed, which is in most cases sufficient to effect a cure, though the use of electricity is an excellent means of expediting recovery.

Pain in the Eye.—Simple pain in the eyeball is generally the result of excessive use of the eyes. It also occurs in cases in which persons who require the use of glasses neglect to use them. It need not be regarded as a very serious symptom if it is only occasioned by overwork and is relieved by proper rest, while the acuteness of the sight is in no way diminished. When it is very acute and continuous, or so severe as to prevent sleep, there are good grounds for apprehending that some serious disease is present. Smarting, burning, or stinging pain in the eye is generally located in the external structures.

Treatment.—Pain due to overuse is relieved by rest and bathing the eyes with tepid water. The pain of inflammation is relieved by hot or cold applications. Cool or tepid applications are generally best in inflammations of the mucous membrane of the lids, and hot applications when the cornea or iris is affected. Thick compresses should never be laid upon the eye. When cold applications are needed, a light compress of three or four thicknesses of linen or a thin sheet of lint should be wet and laid over the eyes, being changed every five or ten minutes, or as often as it becomes warm. In severe cases, several compresses may be employed, being kept cool by laying upon a block of ice. The thinness of the compress allows for evaporation, so that the heat is not retained, as might be the case with a thick compress, which would thus act as a poultice and might be the means of doing much harm.

Blurred Sight—Weak Vision.—This is not a serious symptom when the acuteness of vision is not diminished; that is, if a person can read fine print with ease for a short time, even though the letters soon run together, the difficulty is probably a purely functional trouble which will be readily relieved by rest and tonic treatment. If there is blurred sight, with neither ability to read fine print nor to see small objects clearly even for a short time, the symptom is sufficiently serious to demand immedi-

ate attention from a good oculist. Blurred or weak sight can generally be relieved by the use of spectacles. In many cases the inability to use the eyes for any great length of time is due to some general disease, as nervous debility, dyspepsia, or cerebral congestion. These cases of course require improvement of the general health, or relief of the primary disorder.

Loss of Sight.—In many instances, loss of distinct vision is so gradual that patients are scarcely aware of the fact until their sight has become very extensively impaired. This is especially the case when only one eye is affected. We have met a number of cases in which cataract had become fully developed without the individual being aware of the existence of any difficulty with the eye. Loss of vision is indicated whenever there is blurred sight of either eye with inability to read fine print or to see distinctly small objects which have once been readily discerned. The most accurate way of testing the sight is by means of "test types," such as are shown on page 1501.

If an individual is unable to read under any circumstances the fine print known as "diamond," there is certainly some loss of sight. If he can read the finest type easily for a few seconds, but is then unable to read farther on account of the letters running together, the difficulty can probably be relieved by the use of proper glasses. In employing the test types, the distance at which the different varieties of type can naturally be read should be observed. No. I should be easily read at a distance of one foot from the eye; No. II, at a distance of two feet; No. III, at three feet; No. IV, at four feet; and Nos. VII and XV, at seven and fifteen feet, respectively. Diamond type should be read at a distance of twenty inches from the eye. Pearl should be easily read at thirty, and minion at forty inches. When the letters or sentences can be easily read at the proper distance at first, but afterward cannot be made out without occasioning a tired feeling of the eyes, the indication is weakness of vision. When the test letters cannot be made out at any distance, there is almost entire loss of sight, probably the result of disease.

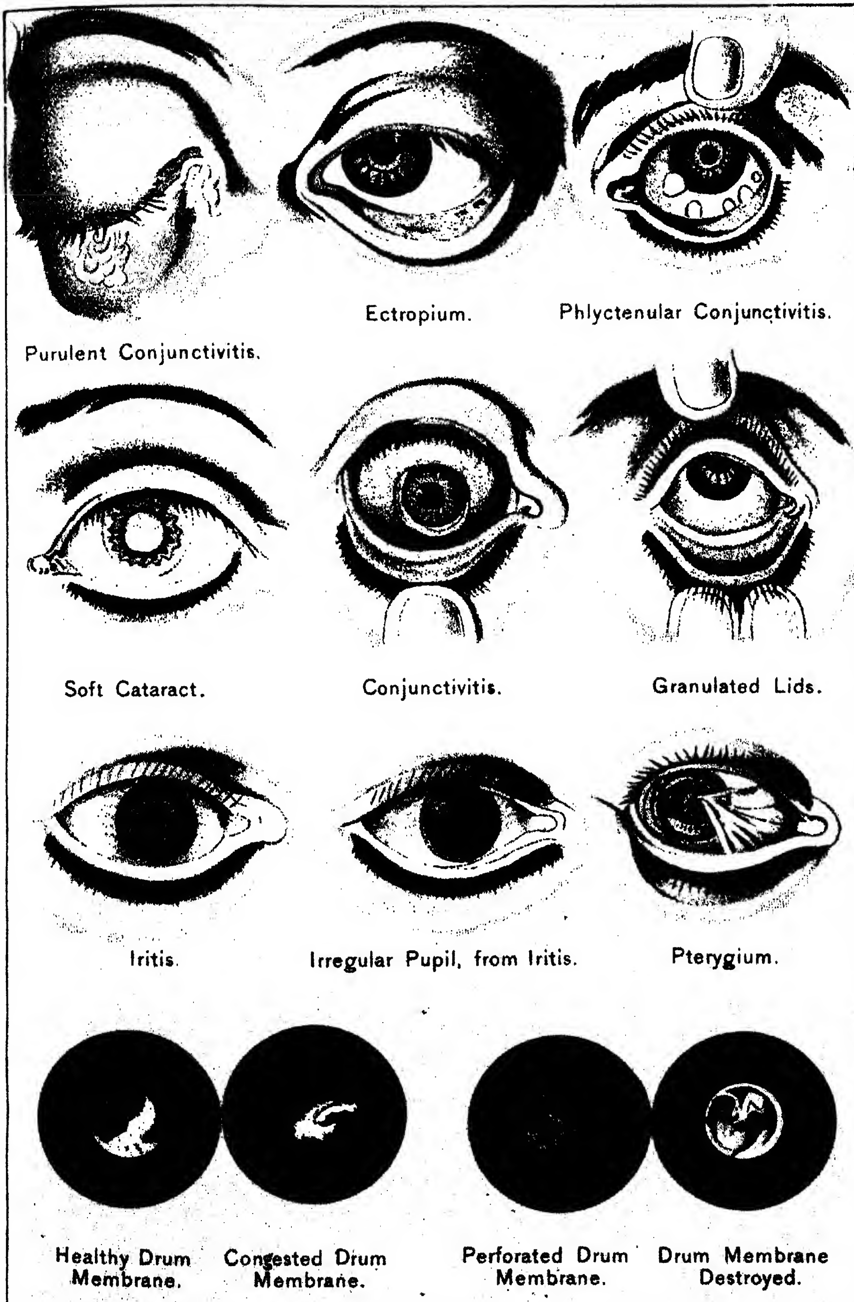

Purulent Conjunctivitis.
Ectropium.
Phlyctenular Conjunctivitis.
Soft Cataract.
Conjunctivitis.
Granulated Lids.
Iritis.
Irregular Pupil, from Iritis.
Pterygium.
Healthy Drum Membrane.
Congested Drum Membrane.
Perforated Drum Membrane.
Drum Membrane Destroyed.

PLATE E.,

TEST TYPES

I.

NPBTVZODPRKOI.

II.

PHKOBUYACEGL.

III.

CECLNPRTVZBD.

IV.

VZBDFHKOSUYA4.

VII.

FHKOSUYACEGL7.

XV.

PRBDHKO15.

DIAMOND.

Should be read at twenty inches.

Our Father which art in Heaven, hallowed be thy name. Thy kingdom come. Thy will be done in earth as it is in Heaven. Give us this day our daily bread, and forgive us our debts as we forgive our debtors. And lead us not into temptation, but deliver us from evil; for thine is the kingdom, and the power, and the glory, forever. Amen.

PEARL.

Should be read at thirty inches.

Our Father which art in Heaven, hallowed be thy name. Thy kingdom come. Thy will be done in earth as it is in Heaven. Give us this day our daily bread, and forgive us our debts as we forgive our debtors. And lead us not into temptation, but deliver us from evil; for thine is the kingdom, and the power, and the glory, forever. Amen.

MINION.

Should be read at forty inches.

Our Father which art in Heaven, hallowed be thy name. Thy kingdom come. Thy will be done in earth as it is in Heaven. Give us this day our daily bread, and forgive us our debts as we forgive our debtors. And lead us not into temptation, but deliver us from evil; for thine

BOURGEOIS.

Should be read at fifty inches.

Our Father which art in Heaven, hallowed be thy name. Thy kingdom come. Thy will be done in earth as it is in Heaven. Give us this day our daily bread, and forgive us our debts as we forgive our debtors. And lead us not into tempta-

Old-Sight—Presbyopia.—In old age the power of accommodation of the eye is diminished. The ciliary muscle becomes weakened, so that it loses its ability to increase the thickness of the crystalline lens by compression. The result of this change is that the individual is unable to see near objects as well as formerly. In reading, he is obliged to hold his book or paper farther away from the eye than usual. Objects at a distance are seen as before, the difficulty being only observed with reference to near objects. By placing a convex lens, Fig. 450, before the eye, the deficient power of the crystalline lens is compensated for, and the patient can see near objects without difficulty, but is obliged to remove the glasses when viewing distant objects. By some means, the process known as accommodation, by which the eye is adapted to view objects at different distances, which the eye becomes incapable of performing in old age, may be imitated by the use of artificial lenses. Old people who are able to see without glasses, generally have an unnaturally long eyeball, in consequence of which their far-sight is deficient, although they may have excellent vision for near objects. Old people are sometimes agreeably surprised by finding themselves able to read without glasses after they have been obliged to use them for many years. This is what is known as *second sight*, which results in a change of the cornea by which the eye is made short-sighted.

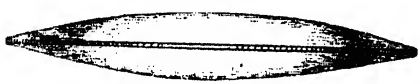


Fig. 450. Convex Lens.

Double Vision and Eye-Strain.— Single vision is due to the fact that the two eyes are so focused by their muscles that the distinct images formed by the two eyes fall upon corresponding portions of the retina, thus making in the brain the impression of a single picture. The ability to thus accurately focus the eyes depends upon the perfect balance of the muscles by which the eyeball is turned in different directions. The weakness of one or more of these muscles may result in an inability to focus the eye perfectly, or the weakness of the focusing muscles may occasion a strain upon the eye, giving rise to reflex pain most commonly manifested as headache. Styes are also a frequent result of a congestion of the eye thus produced. The symptoms commonly attributed to eye-strain are, in the majority of cases, due to indigestion and disorders of the sympathetic nerve.

Long-Sight—Hyperopia.—This is a condiiion in which the eyeball is too short, as shown in Fig. 451. Persons whose eyes are in this

condition usually suffer with great fatigue after a long use of the eye, generally with slight pain or heavy feeling in the forehead. When reading at night, the print soon becomes blurred. After resting the eyes awhile by closing them, or by rubbing or bathing them, the reading may be continued, but the eyes soon become again fatigued. In some cases the individual is utterly unable to read fine print at any distance, and is also unable to see clearly objects some distance away. Persons suffering in this way were formerly considered incurable; but it is now very well known that the defect is easily corrected by means of convex glasses, such as are used for old-sight. The discovery of this fact was made accidentally, after thousands of individuals had been compelled to go through life with continual suffering, under the idea that the weakness of sight was due to commencing blindness, which would be greatly intensified by wearing glasses of any sort. In former times, if a long-sighted child happened to discover that he could read more easily with his grandmother's spectacles, they were quickly snatched away from him, as though they were a dangerous weapon in his hands.

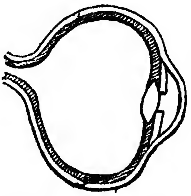


Fig. 451. Eyeball of Long-sighted Eye.

Short-Sight—Myopia.—In this disease, the condition of the eyeball is the opposite of that in long-sight; that is, the eyeball is too long. Fig. 452. The tendency to short-sight in some cases exists at birth. In a great majority of cases, however, it is the result of improper use of the eyes. It is particularly frequent among students and literary people, which is probably due to the sedentary habits of this class of persons, and especially the habit of using the eyes much in close work. The disease is very prevalent in Germany, so much so that the government has found it necessary to allow the use of glasses among soldiers. It is very rare indeed among farmers, sailors, and common laborers. Among savages it is still more rare, if not unknown. An eminent oculist of Breslau, some years ago examined the eyes of over ten thousand school children, with the result of discovering that short-sight increases in students with the length of time the person is in school. In the elementary school, 6.7 per cent of the students were found to be short-sighted. In the next higher grade, the percentage

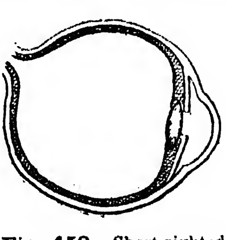


Fig. 452. Short-sighted Eye.

was 10.3. In the high school, about one in every five suffered with myopia; and in the universities or colleges, more than one in every four was so affected. In the high school, nearly one-half of the first class were found to be short-sighted. Examinations made in this country have developed similar facts. The idea sometimes entertained that the short-sighted eye is a strong eye, is a mistake. As a general rule, short-sight is an evidence of unsoundness and disease, which may result in most serious consequences to the sight, possibly ending in its destruction. Short-sight does not, as many people suppose, diminish with age. Although a person may become able to see near objects better than in youth, distant objects do not become more distinct.

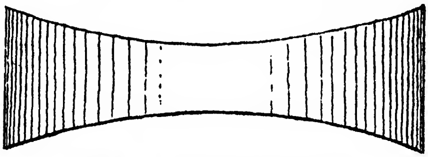


Fig.. 453 Bi-Concave Lens.

Short-sight may be relieved by the use of concave lenses, Fig. 453, placed before the eye, by means of which the error in vision arising in consequence of too great length of the eyeball may be corrected. Persons with short-sight generally do not need glasses in reading, unless they are obliged to hold print very near to the eye, but are wholly dependent upon properly fitted glasses for vision at a distance. Wearing of properly fitted glasses is an advantage rather than a detriment to short-sighted eyes, but care should be taken to secure an accurate adjustment of the glasses to the eye. This can only be done by a competent physician who has given his attention to the subject. In addition to the fitting of proper glasses, attention should be given to the general health, and to careful removal of all causes of this condition.

Astigmatism.—This is a condition of the eye in which the curve of the cornea is not symmetrical, or uniform. The consequences of this condition are much more serious than those resulting from long or short-sightedness. Nearly all objects are seen distorted. The most perfect eye is not absolutely symmetrical, and when the want of symmetry is more or less increased, the eye becomes astigmatic. A person suffering with this affection of the eye can see horizontal lines more distinctly than vertical ones, though sometimes the reverse is the case. This condition may be detected by means of the test diagram (Fig. 454). If this is held a distance from the eye and gradually brought near to

it, it will be discovered that either the horizontal or the vertical lines are indistinct. In some cases this is true of the oblique lines, instead of the vertical or horizontal.

Astigmatism, like long-sight and short-sight, but in a much greater degree, has a considerable effect upon the character. Persons who are born with this defect never know the proper forms of objects until the defect is corrected by the proper glasses. We have now under treatment a lady who never knew the form of the human face until a pair of glasses were fitted to her eyes. The change in the appearance of objects was so great that she at first was unable to recognize her husband without taking off her glasses. She expressed the most exquisite delight at the improved appearance of various objects which she beheld for the first time in their proper form. Astigmatism is corrected by means of glasses ground from a cylinder in such a way as to overcome the optical defects of the eye.

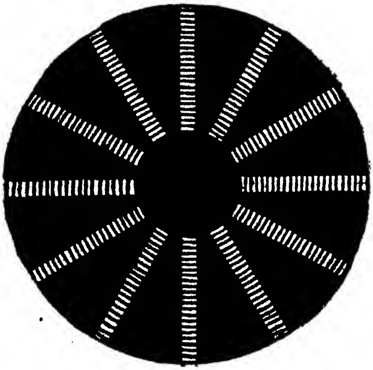


Fig. 454.
Test for Astigmatism.

Glasses.—Proper glasses should be selected and carefully fitted to the eyes whenever they are affected by old-sight, long-sight, short-sight, or astigmatism. A competent physician or an oculist should be consulted in every case with reference to the wearing of spectacles, and their adaptation to the eye. Spectacle venders who travel about the country should not be patronized under any circumstances. Glasses made of flint glass, or of what is known as rock crystal or Brazilian quartz, are the best. The last variety is known as "pebble" glass. The only advantage which it has over other glasses is its hardness. Spectacles should also be perfectly clear and free from irregularities in the glass.

It is sometimes advantageous to wear glasses for the purpose of protecting the eye from mechanical injury, when they are much exposed, as in certain trades. Colored glasses, as London smoke, green or blue glasses, are also necessary in many cases to protect the eye from intense light. Protection of this sort is very necessary for travelers in snowy regions, whose eyes are likely to suffer from the

dazzling brightness of the reflected sunlight, producing an affection known as snow blindness. For the convenience of persons who are obliged to use two sets of glasses, one for viewing near objects, the other for distant vision, spectacles are sometimes made in which the lower part of the lenses is ground so as to be adapted to near vision, while the upper part is adapted to distant vision. These are known as Franklin glasses because they were invented and first used by Benjamin Franklin. The kind of frame to be employed is wholly a matter of taste.

Color-Blindness.—This is an affection known as Daltonism, from the man who first described it, and is more common than is generally supposed. Persons suffering with this difficulty are unable to distinguish red, green, or other colors. In some cases, only the form of objects is discerned, all appearing of the same color. The affection is much more common in men than in women. Great harm may result from this defect, which exists in this country to the extent of about four per cent of the whole male population. It is especially dangerous in persons employed as pilots or engineers of railroad trains. It is an interesting fact worthy of notice that the color which the patient is unable to discern appears to him to be gray. It is probable that color blindness is in part, at least, due to the want of proper education of the eye in discriminating colors in early childhood. The defect is in many cases hereditary. It has been recently announced that color-blindness may be corrected by means of a pair of spectacles composed of two plates of glass between which is placed a thin layer of *fuchsine.*

DISEASES OF THE EAR.

Discharge from the Ear.—When a discharge from the ear is not accompanied by any marked interference with hearing, it is probably the result of an abscess in the auditory canal. When preceded by severe earache, and accompanied by marked deafness, and when of very long standing, the discharge probably comes from the middle ear, in which the process of suppuration is taking place.

Treatment.—Syringe the ear thoroughly one to three times a day, according to the amount of discharge, employing tepid water with the syphon or fountain syringe. Care should be taken not to use too great force, as the membrane of the ear may be ruptured. The ear

should be drawn upward and backward, and the nozzle of the syringe should be introduced about one-fourth of an inch. If the discharge is very offensive, a carbolic acid lotion in the proportion of five drops to the ounce, or a solution of permanganate of potash, twenty grains to the pint, should be employed. Pack the ear with dry boracic acid.

Abscesses in the Auditory Canal.—Small boils, or furuncles, sometimes form in the walls of the auditory canal, giving rise to impairment of hearing. They seldom occasion roaring in the ears, which is a symptom met with in nearly all other diseases of the ear.

Treatment.—Apply hot fomentations and the hot ear douche, and lance as soon as possible, continuing the hot douche afterward as before. The vapor douche is an excellent means of treatment when it can be employed. A cotton plug saturated with glycerine and placed in the ear will often give great relief. The ear should be carefully protected from cold air, especially when out of doors. Attention should also be given to the general health, which is always more or less impaired in these cases. Lancing the abscess often gives speedy relief.

Earache.—This is by no means so trivial an affection as is generally supposed. Pain accompanied by roaring or ringing sounds and a sense of fullness, is generally due to inflammation of the middle ear, which may result in permanent impairment of hearing if not given proper attention. In many cases, obstinate crying of children is due to earache. Earache is sometimes sympathetic with disease of the teeth. The most common cause, however, is taking cold in the head or ears.

Treatment.—The best remedy is heat, which may be applied by means of fomentations, rubber bags filled with hot water, flannel bags filled with hot sand, bran, or corn meal, or poultices. Whatever the applications are, they should be made as hot as can be borne. It is usually necessary to continue the applications for some time. In most cases, it is advantageous to employ fomentations of sufficient size to cover the whole side of the head and extend under the chin. The application of a roast onion to the ear is a very favorite remedy, but probably has no advantage over fomentations. The application of the hot douche to the ear is a very excellent remedy if used with care. The water should be as hot as can be borne. The hot foot bath, hot sitz bath, and the hot blanket pack, are often effective in relieving pain in the ear. They should be employed in connection with local treatment.

Hardened Ear-Wax.—Hardening of the cerumen, or ear-wax, is a not very infrequent cause of deafness, and is by no means so harmless a condition as is generally supposed. In many cases the hardening is not the primary disease, but is due to chronic inflammation of the middle ear. The most prominent symptoms of this condition are, impairment of hearing, roaring and pain in the ears. The practice of probing the ear for the purpose of ascertaining whether it contains hardened ear-wax is a very hazardous one, as it may excite inflammation of the canal of the ear, or even rupture the drum. Cleaning the ears with the end of a towel, or with a bit of sponge attached to a handle, is a bad practice, as the wax is crowded in. The wax sometimes becomes almost as hard as stone.

Treatment.—Hardened wax may be readily removed, in most cases, by the ear douche with warm or hot water. In case the wax is very hard, it may be necessary to use quite strong soap-suds, or to place in the ear a few drops of a strong solution of bi-carbonate of soda. A good plan in these cases is to drop into the ear while the head is bent over, a small lump of bi-carbonate of soda, which can be easily pressed down in contact with the wax, after which a few drops of water should be added. Persons subject to hardening of the ear-wax should syringe the ears thoroughly every six or eight weeks. The proper treatment for other foreign bodies in the ear has been given elsewhere. See page 1439.

Ringing in the Ears—Tinnitus Aurium.—Under this head is included all cases in which there are unnatural sounds in the ear. The description of these sounds given by different patients is exceedingly varied. Some complain of sounds resembling the roaring of a waterfall, the rumbling of a carriage in the street, or a train of cars etc.; while others are continually troubled with a snapping, crackling sound, and similar disturbances. This affection is often a very annoying one, sometimes resisting all remedies. Among the principal causes are hardened ear-wax, foreign bodies in the auditory canal in contact with the drum membrane, inflammation of the middle ear, etc. The most obstinate cases are probably due to disease of the nerve of hearing.

Treatment.—Hardened wax, or other foreign bodies, should be removed. When resulting from congestion, relief is sometimes obtained by pressure upon the large arteries of the neck. Electricity has also

proved of great service in some cases, though in others it has not succeeded. The galvanic current and massage are the most successful.

Parasitic Inflammation of the Auditory Canal.—The external end of the canal is sometimes subject to inflammation in consequence of the growth of vegetable parasites of the nature of fungi. The most common is some variety of the aspergillus. The principal symptoms are pain, dizziness, impairment of hearing, and a discharge from the ear.

Treatment.—The same treatment should be employed as has been recommended for the preceding disease. The persistent use of hot water will thoroughly destroy the parasites, but the discharge will still continue, in some cases, requiring the treatment recommended for discharge from the ear.

Acute Inflammation of the Middle Ear.—Inflammation of the middle ear is the cause of earache. It occurs at all periods of life, but is especially common in young persons. The most frequent cause is taking cold in the head or in the ears. When frequently repeated, it may lead to chronic catarrh and permanent impairment of hearing. Prolonged bathing, especially in cool weather, or ducking the head under water, is a frequent cause of catarrh of the ear. Prof. Roosa, an eminent aurist, also asserts that the use of tea and coffee, pastry, and other improper articles of diet, is a frequent cause of this disease.

Treatment.—The treatment of acute catarrh of the middle ear is a matter of great importance for the reason just given. If prompt, energetic measures are not employed, the drum membrane is not infrequently perforated by ulceration. This is not an accident fatal to hearing, however, as openings of this kind generally heal quite readily with proper treatment. Essentially the same treatment should be employed as has been recommended for earache, the most useful being fomentations and the hot ear douche. Simply breathing into the ear for a few minutes will sometimes check the disease in children. Pouring into the ear sweet oil, glycerine, molasses, laudanum, cologne water, etc., is not only useless, but in many cases harmful. There is also danger from the use of poultices if too long employed. Fomentations should be applied to the throat as well as to the ear. In severe cases, when a considerable amount of suppuration occurs, it is sometimes necessary to employ a competent surgeon to lance the drum membrane so as to allow the accumulated fluid to escape. As soon as the symp-

toms have disappeared, the ear should be inflated by grasping the nose so as to close the nostrils tightly, closing the mouth and then attempting to blow through the nostrils. By this maneuver, air will be forced up into the ears, and in many cases, the impairment of hearing will be at once relieved to a considerable degree, if not altogether. In cases of children who are unable to perform the experiment, the ears may be inflated by putting into the nostril one end of a piece of rubber tubing through which the mother or nurse should blow, while the mouth and other nostril of the infant are tightly closed. When the soreness and swelling have passed away, the ear should be carefully tested to determine whether or not the hearing is seriously impaired. Persons subject to inflammation of the middle ear should be very careful not to expose themselves to taking cold in any way. Special pains should be taken to protect the ears from exposure to drafts of cold air. In the majority of cases, complete recovery takes place.

Chronic Catarrh of the Middle Ear.—This is a very serious affection of the ear, and one to which about one-half of all cases of deafness are due. The disease is generally accompanied by slight pain, heat, and uneasiness about the ear. It is often the result of repeated attacks of acute catarrh of the middle ear. In a majority of cases it results from long-continued nasal and pharyngeal catarrh. Patients frequently complain of sounds in the ear, like the crackling of air bubbles. There is generally more or less ringing in the ears and a sense of fullness. Dizziness is also a not infrequent symptom. In many cases there is a tendency to an accumulation and hardening of the ear-wax. Generally, also, a slight tenderness will be found by pressing with the finger in the hollow just below the ear, or over the front part of the ear. In some persons, however, scarcely any symptoms except those of impaired hearing are present. In not a few instances the disease progresses so insidiously that the patient is unaware of his condition until his hearing is destroyed. On the day of this present writing, we have met with two illustrations of this fact. A clergyman called at our private office, and with much concern apprised us of the fact that he had just made the discovery that the hearing of his right ear was very greatly impaired. His attention was called to the fact by incidentally placing a watch to his ear to see if it was running. On testing the ear, we found that it possessed only one sixteenth of its natural acuteness, and upon examination of the left ear, we found, very much to the gentleman's surprise, that its hearing was also very greatly impaired,

the watch which should have been heard at a distance of four feet being barely made out at a distance of a foot. Within an hour, while examining a patient from a distant State with reference to the condition of his general health, we incidentally tested his hearing, although he remarked very emphatically that his ears were perfectly sound. In this case, we found the left ear had lost fully three-fourths of its acuteness, while the hearing of the right ear was almost entirely destroyed. The gentleman was so greatly astonished at the result of the examination that he was only convinced of his real condition after the test had been repeated several times.

A curious phenomenon is sometimes observed by persons suffering with chronic catarrh of the ear. When surrounded with loud noises, as riding in a railroad car, they are able to hear as well as, or even better than, persons whose ears are perfectly healthy, although very deaf at other times. The cause of this improvement of hearing is not well understood, but it has been thought that it may be due to the fact that

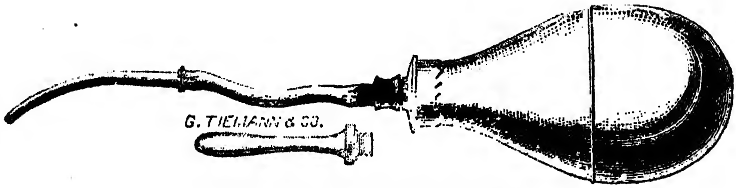


Fig. 455. Politzer's Rubber Bag.

the powerful vibrations produced by loud noises set in motion the membrane of the ear, which is thickened and rendered rigid by disease. An English physician, taking a hint from this fact, has suggested the exposure of the ear to loud noises as a mode of treatment. This plan of treatment has been termed ear gymnastics.

In order to ascertain whether the Eustachian canal is open and the membrane movable, it is necessary to inflate the ear. This is done by forcing air into it by means of Valsalva's method, which consists in attempting to blow the nose while the nostrils are tightly closed with the thumb and finger, or still better, by Politzer's method, in which air is forced into one nostril by means of a rubber bag, Fig. 455, the patient swallowing at the same moment that the air is forced into one nostril, the other being closed. In cases in which the air cannot be made to enter the ear by either of these methods, it is necessary to use the Eustachian catheter, Fig. 456. When air enters the ear, the movement

of the structures of the middle ear can be distinctly heard by means of the otoscope, or diagnostic tube, Fig. 457, one end of which is placed in the ear of the examiner, and the other in the ear of the patient undergoing examination. These instruments are also very essential in the treatment of many diseases of the ear.

Treatment.—Unfortunately, in the majority of cases of chronic catarrh of the middle ear, little can be done to improve the hearing of the patient. About the best that can be hoped for is to check the progress of the disease, and perhaps secure a little improvement The

Fig. 456.

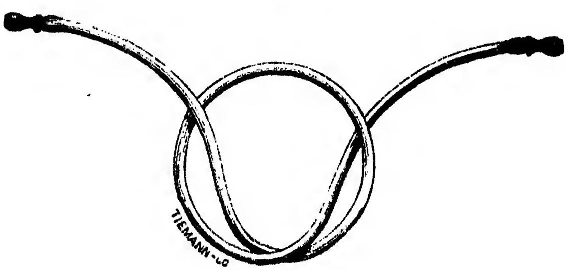


Fig. 457.

first attention should be given to the throat, which will in nearly all cases be found to be the seat of chronic catarrh, though in many cases there is also nasal catarrh. For the relief of these difficulties, the treatment elsewhere recommended for them should be adopted and thoroughly employed, not for a few weeks only, but persistently for months and years.

Among the various measures for this purpose, are the post-nasal douche, steam inhalation, and gargles. The best remedy for use as a gargle is chlorate of potash, a strong solution of which should be used two or three times a day. The usual method of employing the gargle is very ineffective, as the soft palate prevents the solution from reaching the seat of the disease. In order to be of any service, the gargle should be taken as follows: Take into the mouth about a tablespoonful of the solution, throw the head backward as far as possible, close the nostrils, and make the motions of swallowing without,

however, allowing the liquid to pass into the stomach. By this means the solution may be made to pass up into the back part of the throat over the diseased surface. The Perfection Vaporizer should also be used (see Appendix).

Alternate hot and cold applications made to the throat and over the ears, are valuable means of aiding a cure. Electricity may also be applied to the ears with advantage in many cases. When the external canal of the ear is dry and irritable, much relief may often be given the patient by anointing it with carbolated vaseline, ten drops to the ounce, sweet oil, or almost any other unguent. Great care should be observed to avoid taking cold. In cases in which the tonsils are enlarged, which are by no means rare, they should be removed. Attention should be given to the general health, as in many instances the hearing may be greatly benefited by improvement of the condition of the stomach. Massage of the ear is of great service in these cases. (See "The Art of Massage," Modern Medicine Pub. Co., Battle Creek, Mich.)

Nervous Deafness.—This is one of the most hopeless of all diseases of the ear. It is by no means so common, however, as formerly supposed, before diseases of the ear were as well understood as at present. Formerly, all diseases of the ear which could not be traced to other causes were attributed to disease of the auditory nerve.

One of the most interesting discoveries appertaining to this class of maladies is the fact that diseases of the auditory nerve can be distinguished from diseases of other portions of the ear by means of the tuning-fork. If the tuning-fork be sounded, and the handle placed at the center of the forehead, the sound will be heard most distinctly in the affected ear if the deafness is in the middle ear or due to hardened ear-wax. If, however, it is due to disease of the auditory nerve, it will be heard most distinctly in the unaffected ear.

Treatment.—Improvement of the general health and the application of galvanic electricity to the ear are about the only measures of advantage. When both ears are affected, the electricity may be applied by means of small sponge electrodes which should be placed at the openings of the auditory canal or just behind the ear. When only one ear is affected, the positive pole should be placed at the back of the head and the negative at the opening of the ear or upon the prominence just behind it.

Rupture or Perforation of the Membrane of the Ear may result from exposure of the ear to loud sounds, as the firing of a cannon or a violent explosion of any kind, or perforation may occur by puncturing with an instrument used in removing wax from the ear, or accidentally introduced into the auditory canal, or by ulceration as a result of suppuration of the middle ear. Cases of rupture of the membrane have also been known to occur in consequence of the injudicious use of the nasal douche. Rupture of the membrane has also been caused by boxing the ears, or by a blow upon the ear from a snow-ball. The accident generally causes loud buzzing in the ear and confusion in the head. In many cases the ear whistles when the patient blows his nose, due to the passage of air through it. The condition of the drum membrane is easily ascertained by an examination by means of the ear speculum, of which two forms are shown in Figs. 458 and 459. Light is thrown upon the membrane through the speculum by means of the concave mirror, such as is used in examining the throat. Fig. 296.

Treatment.—The pain may be relieved by fomentations. If inflammation occurs, hot douches to the ear should be employed, but not otherwise. In a majority of cases, rupture of the membrane heals quite readily, especially when it is the result of puncture with a sharp body, as a knitting-needle.

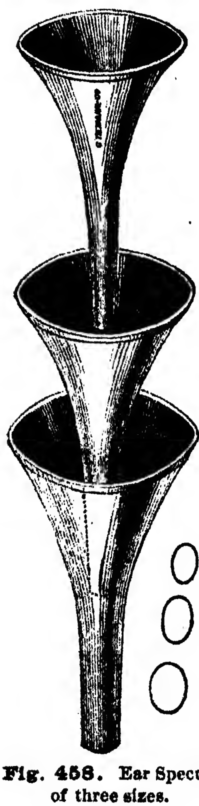


Fig. 458. Ear Specula of three sizes.

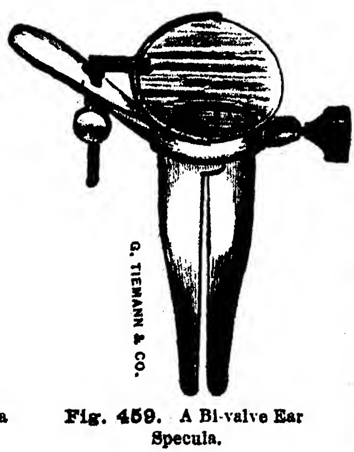


Fig. 459. A Bi-valve Ear Specula.

Ear Trumpets.—Quite a variety of instruments have been invented for the purpose of intensifying sound for the benefit of those who are hard of hearing, in cases in which the middle ear is the seat of the disease, the auditory nerve remaining intact. Two of the most useful instruments are shown in Figs. 460 and 461. Auricles, Fig. 462,

are of rather doubtful value. The conversation tube, Fig. 463, is a very serviceable instrument. Fig. 464 shows at *a* and *b*, small silver cornets, which are recommended on account of the ease with which they can be concealed. They are, however, of little value as aids to hearing. Some years ago the discovery was made that a small bit of moist cotton in the ear adds greatly to the hearing power when the drum membrane is ruptured. Artificial drum membranes (Fig. 465) are now made and are very serviceable in some cases, though not all are benefited by them.

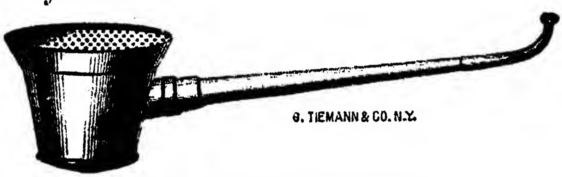


Fig. 460. Dipper Trumpet.

Fig. 461. Ear Trumpet.

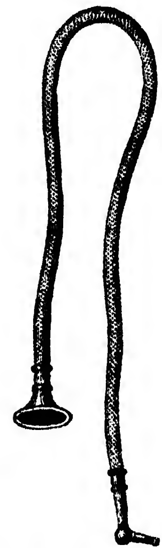


Fig. 463. Conversation Tube.

Fig. 464. Small Silver Cornets.

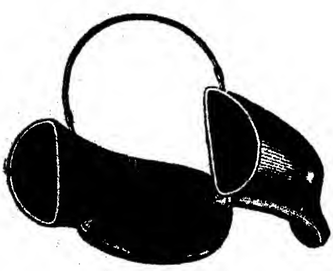


Fig. 462. Auricles.

Fig. 465. Artificial Drum Membrane.

Fig. 466. The Audiphone.

The audiphone, Fig. 466, is a recent invention which is of service in some cases of deafness, though it is by no means so universally applicable as has been claimed by its inventor. It is composed of a sheet of gutta-percha attached to a handle and made tense by means of a cord. In use, the upper edge is placed against the front teeth, through which the vibrations of sound are communicated to the bones of the

skull and to the auditory apparatus. The principal objection is its price, which is very exorbitant when compared with its actual cost. A sheet of card-board eight or ten inches square may be used in the same way as the audiphone. The dentaphone is practically the same as the audiphone, the only difference being that it may be folded so as to be convenient to carry in the pocket. The megaphone, an instrument by which very distant sounds may be distinctly heard when wholly imperceptible to the unaided ear, is one of the numerous inventions of Mr. Thos. A. Edison. The instrument constructed by him, the marvelous powers of which were exhibited to us by his laboratory assistant, is of such mammoth proportions as to be of no particular value for the relief of deafness. It is quite doubtful whether it can be sufficiently reduced in size to be of any value for this purpose.

Deaf-Mutism.—Persons who are deaf and dumb are generally unable to speak in consequence of being unable to hear, which prevents their learning the significance of vocal sounds, although the vocal apparatus may be perfectly developed. Persons may be born deaf in consequence of imperfect development of the organs of hearing, or of disease of the ear previous to birth. In many cases, deafness is the result of diseases occurring in infancy or early childhood. It is not necessary that hearing should be entirely destroyed to produce deaf-mutism, as a considerable degree of impairment of hearing will often prevent a child from making the necessary attempts to learn to speak. It is thought that the marriage of persons nearly related, is a frequent cause of deaf-mutism, as it has been supposed to be of idiocy.

Treatment.—Although in these cases there is no call for treatment for the purpose of restoring the hearing, there is an imperative necessity for the employment of proper measures by means of which the condition of these unfortunate individuals may be ameliorated. The experience of numerous deaf and dumb asylums in this and other countries has shown beyond question that deaf mutes are capable of a high degree of mental culture and such a course of training as will render them able to compete with their more fortunate fellows in the various departments of life. Educated mutes are able to communicate readily with each other by means of the "sign language," a sort of natural mode of speech which is in common use among the North American Indians and other savage tribes. Attention was first called to this mode of mute speech through its use by two deaf-mute sisters.

DEAF AND DUMB ALPHABET.


467. A


468. B


469. C


470. D


471. E


472. F


473. G


474. H


475. I


476. J

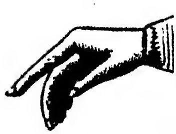

477. K

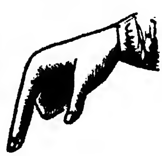

478. L

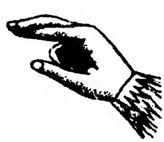

479. M


480. N


481. O


482. P


483. Q


484. R

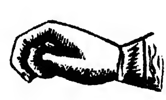

485. S


486. T


487. U


488. V

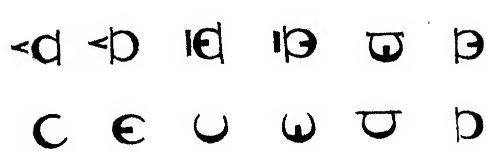

489. W


490. X


491. Y


492. Z


493. &


494. VISIBLE SPEECH.

It has been improved and perfected, until it admits of great fluency of expression and is capable of expressing ideas with sufficient rapidity to follow very closely an ordinary speaker. Educated mutes usually make use, to a greater or less extent, of the manual alphabet, page 1517, by means of which words may be readily spelled out. The greatest advance in the instruction of the deaf and dumb, has been through the discovery that mutes can be taught to understand spoken language by carefully watching the movements of the lips and throat, and can also become able to speak by imitating the movements by which various sounds are produced. This is known as the "German method." A successful attempt has been made to illustrate the various sounds of speech by means of symbols termed "visible speech," a few illustrations of which are given in Fig. 494.

TUMORS.

Of the great variety of tumors to which the human body is subject, the great majority are of a benign character, although the great number of cancer doctors, with whom the country is infested, and who attach the name of cancer to every morbid growth no matter how simple and harmless its character, have given rise to such a widespread misapprehension upon this subject that the term tumor is in the minds of most people almost synonymous with cancer or malignant disease. Tumors of this class may consist of fibrous, mucous, fatty, osseous, cartilaginous, muscular, or vascular tissue. They produce no symptoms except those which arise from pressure or weight.

Fibrous Tumors.—These growths are quite firm in character and slow in growth. They are found more often in the uterus than in any other organ. They also occur in the skin, in the throat, in the nasal cavity, in the lobe of the ear, and in other parts of the body. They not infrequently contain sacs which are filled with fluid. The proper treatment is removal when the growth occurs in such a location as to be productive of inconvenience or a source of interference with the function of any organ of the body.

Fatty Tumors.—These are more common than any other variety of tumor. They generally grow very slowly, and sometimes attain to very great size. They are formed by an increased growth of fatty tissue. They are distinguished from fibrous tumors by being less firm in character. They have a peculiar doughy feeling. Treatment con-

sists in removal when the tumor becomes so large as to occasion serious inconvenience.

Cartilaginous Tumors.—These tumors are much less frequent than the preceding. They most frequently occur upon the joints of the fingers and the toes. They have a marked tendency to degenerate into malignant growths, and hence should be removed as soon as distinctly recognized.

Bony Tumors.—These growths are sometimes composed of bony tissue alone, at other times a mixture of bony and cartilaginous tissue. In still other cases, they consist largely of fibrous tissue. They are sometimes quite well defined in shape, and in other cases are more diffused. The most common form of bony tumor is that known as sarcoma, which is closely allied to cancer.

Treatment.—In cases in which it can be clearly determined that the tumor is a sarcoma, the proper treatment is amputation of the limb as far above the disease as possible.

Cystic Tumors.—Cystic tumors consist of cystic growths which are generally filled with fatty matter of a cheesy consistency, or serum. The most common is that known as "wen." Proper treatment is division of the cyst with a knife, and the removal of the sac. Cystic tumors of the ovary require removal.

Horny Tumors.—These growths are of very infrequent occurrence. They occur most often upon the head, and have been observed upon the tip of the nose. They are readily cured by removal.

Cancer.—This formidable malady, though at first of a local character, sooner or later involves the whole system through absorption of what is known as the cancer juice, or the broken-down elements of the growth. There are several varieties of cancerous or malignant growth. Its most frequent location is the breast. It occurs most often in persons between the ages of thirty and fifty, though occasionally appearing at a much earlier or later age. The variety of the disease popularly known as *stone* cancer, so called on account of its excessive hardness, is the most common. After ulceration has taken place, the term *rose* cancer is frequently applied. *Black* cancer is a form of the affection in which there is a great increase of coloring matter, producing a dark color.

Epithelioma is the proper name of what is ordinarily known as "*skin* cancer." Cancer may occur in any part of the body. It is gen-

erally accompanied by pain, and sooner or later by severe ulceration.

Among the causes of cancer, probably local irritation, as of the tongue and lips from a pipe and tobacco smoke, is the most active. Irritation of the tongue from a decayed tooth has also occasioned cancerous disease in that organ.

Treatment.—There is no internal remedy which exercises any curative influence over this disease, neither is there any remedy which by external application will cause the cancer to be absorbed or disappear. The only remedy is removal of the diseased part, which should be accomplished as thoroughly and quickly as possible after its character has been discovered. This may be accomplished by means of caustics of various kinds, or by the knife. The latter method is generally to be preferred as the most thorough and effective. We have used both methods in the treatment of cancer, and unhesitatingly pronounce the latter as superior in a great majority of cases. Frequent freezing of a malignant growth, and constantly wearing upon it an ice bag or compress, are means of delaying the progress of the affection.

MISCELLANEOUS SURGICAL DISEASES AND OPERATIONS.

Ligation of Blood-Vessels.—This is an operation which is generally performed by the surgeon, but which almost any person may be called upon to perform in an emergency. The operation consists in

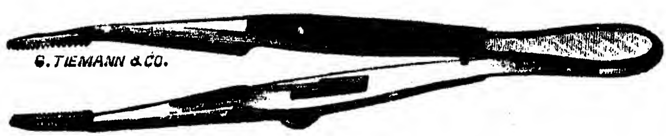


Fig. 495. Artery Forceps.

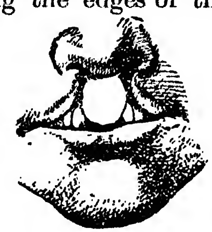
seizing the end of the bleeding vessel with a pair of forceps (Fig. 495), and tying the artery with a ligature of silk or some other strong material. Catgut, horse-hair, silver and iron wire, and other similar substances are employed for this purpose. Silk ligatures are quite irritating in character, and consequently soon come away by ulceration. When the wound must be closed immediately, catgut ligatures are employed, which are after a time absorbed, so that no further attention need be given them.

The operation of torsion, which consists in twisting the end of the severed artery, is now often employed instead of the ligature.

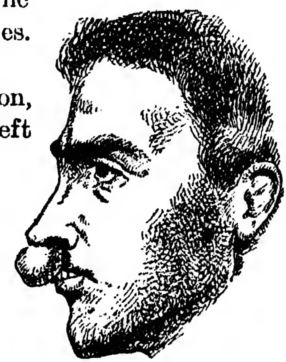
Hare-Lip.—This deformity results from failure of the bones of the two sides of the face to unite in the process of development. When the difficulty occurs upon one side alone, the patient has single hare-lip. When it occurs upon both sides, the deformity is double. The appearance of this deformity in its different phases is well shown in Figs. 496 to 498. The difficulty seems to be hereditary in some families. It occurs most often in males.

The only remedy is a surgical operation, which consists in paring the edges of the cleft

496.



497.



498.

on each side and bringing them together with proper sutures. The operation is generally a very successful one. It should be performed, by preference, sometime between the third month and the period of teething.

Cleft Palate.—This difficulty may exist either alone or in connection with hare-lip, being also the result of defective development. The cleft may involve simply the uvula, or hanging part of the soft palate, or may extend through the whole roof of the mouth. A person suffering with an extensive cleft of the palate, has a peculiar nasal tone of voice and great indistinctness of articulation.

The treatment consists in closure of the cleft by a surgical operation. As a general rule, the operation is by no means so successful as in hare-lip. The art of dentistry presents a much more perfect remedy in an artificial hard palate to close the roof of the mouth, to which is attached, at the back end, an artificial soft palate composed of rubber.

Restoration of the Nose.—This is one of the nicest operations in mechanical surgery, and, when successfully performed, results in the removal of a hideous deformity, as the human face can hardly be more terribly disfigured than by the removal of the nose, as the result of either accident or disease. The operation consists in transplanting portions of skin from the forehead.

Polypus of the Nose.—There are two kinds of polypi found in the nasal cavity, *mucous* and *fibrous*. The mucous polypus is by far the most common. It has a soft consistency, is of a pale yellowish gray, or slightly greenish color, of a shiny and somewhat translucent appearance. These polypi may occur singly or multiple. They generally produce a sense of fullness and weight in the affected nostril, which may become so much obstructed as to interfere with the respiration and affect the voice. The greatest difficulty is always experienced during damp weather.

The treatment consists in removal by means of a snare or forceps. The growth should be grasped near its root and forcibly torn from its attachment. Fibrous tumors, when small or young, may be treated in the same way. They sometimes, however, become so large as to require a much more serious surgical operation.

Elongated Uvula.—When the uvula becomes greatly elongated, as is sometimes the case, it becomes necessary to remove a portion of it. This is done by grasping the end of the organ with a pair of forceps and snipping off one-half or two-thirds of its length.

Alveolar Abscess—Ulcerated Teeth—Gum-boil.—This consists in the formation of an abscess at the root of a tooth. It is generally the result of decomposition of a dead nerve or of the pulp of a tooth. The first symptoms felt are soreness of the affected tooth, which feels longer than usual. After a few hours, severe pain begins, which continues four or five days, after which a swelling upon the gum near the tooth may be discovered, which in time, if left to itself, breaks and discharges. If not properly treated, the abscess may continue to gather and break for a long time. Proper treatment consists in cold applications to the side of the face, holding ice or iced water in the mouth in order to limit the inflammation as much as possible, and lancing of the abscess when it is formed. A skillful dentist should be employed to treat the teeth.

Salivary Calculus—Tartar.—This is an incrustation which is formed upon the teeth, chiefly on the inner portions, through decomposition of the saliva. It varies in color from whitish yellow to a dark brown, and even green. When tartar is allowed to accumulate in large quantities, it often causes absorption of the gums, so that the teeth become loosened and their utility greatly lessened. A person suffering with tartar upon the teeth, generally has bad breath. The tartar should be thoroughly removed from the teeth by a competent

dentist, and the teeth should be kept entirely free from any deposit of this sort by means of daily cleansing and thorough brushing. The teeth may be greatly injured by neglect of this precaution.

Decay of the Teeth.—Decay, or caries, of the teeth is an exceedingly common affection. It is generally produced by decomposition of portions of food left between the teeth, which undergo decomposition, developing substances which have the power to dissolve the enamel. When the teeth are only slightly diseased, and even when quite badly affected with caries, they may be saved if properly filled by a competent dentist. The teeth should be preserved whenever it is possible to do so. Decay of the teeth is due to the action of germs, many varieties of which give rise to caries.

Toothache.—Toothache is generally due to exposure of the sensitive interior portion of the tooth after the loss of the non-conducting enamel. Filling the cavity will at once relieve the pain, and may preserve the tooth indefinitely. When the tooth is sensitive, feels too long, or if pain is felt when biting upon it, there is probably an inflammation in the nerve or about the root of the tooth. When the root becomes diseased, it will sooner or later be necessary to draw the tooth, in most cases.

Simple toothache is quite promptly relieved by the application of heat by means of a hot brick wrapped in flannel, a rubber bottle filled with hot water, or by some other similar means. Temporary relief may generally be obtained by applying to the cavity a bit of cotton saturated with a mixture of creosote and oil of cloves, equal parts. The medicated cotton may be advantageously covered with a bit of cotton moistened with varnish. Cocaine and similar drugs should never be used for relief of toothache.

Tongue-Tie.—This is an affection in which the frænum of the tongue extends too far forward. The remedy is simply division of the superabundant tissue, care being taken to avoid cutting the arteries of the tongue.

Tracheotomy.—This operation consists in making an opening into the trachea, and the insertion of a silver tube, through which the patient may breathe. When the opening is made into the larynx, the operation is known as *laryngotomy*. The operation is performed in cases in which there is serious obstruction in the upper part of the trachea, or larnyx.

Goitre, or Bronchocele.—This disease consists in an enlargement of the thyroid gland. When of recent standing, it can generally be cured by improvement of the general health, hot and cold applications to the throat daily, the local application of the faradic current strongly interrupted, and the application of uniform pressure. Galvanic electricity is also useful in some cases.

Hernia—Rupture.—This accident consists in protrusion of some portion of the contents of the abdomen through an opening in its wall. There are several varieties, the chief of which are *umbilical, inguinal,*

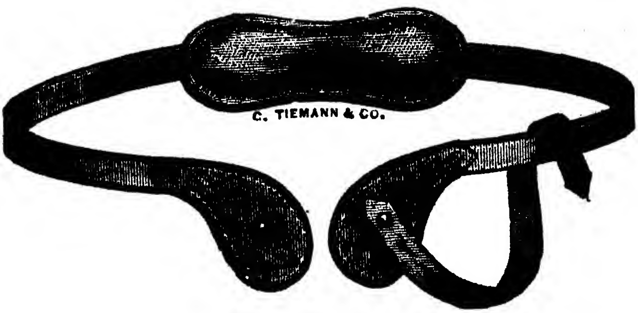


Fig. 499. Truss.

and *femoral*. Hernia may be single or double, as it occurs upon one or both sides. It is often the result of lifting, or of straining at stool.

Treatment.—A person who has hernia should never be without a properly fitting truss. Fig. 499. It should be worn constantly, as when the hernia is allowed to come down, it may become strangulated, so that it cannot be returned, and may speedily terminate the life of the patient. When hernia gets down in this way, it can generally, if taken in hand at once, be readily reduced by careful manipulation, termed *taxis*. Taxis should be performed by placing the patient in an easy position, with his limbs flexed so as to take off all strain from the abdominal walls, and then endeavoring to push the protruding bowel back through the opening by means of which it has escaped from the abdominal cavity. It is no longer necessary that sufferers from hernia should go through life crippled in consequence of this trouble, or to employ so clumsy and inconvenient a remedy as the hernial truss. It is now possible, by a simple operation, to effect a radical cure of all the different forms of hernia, and without any extreme degree of risk to the patient's life.

Piles, or Hemorrhoids.— These are small tumors which form just within or just external to the anus, from dilatation of the veins of the part. When within the anus, they are known as *internal* hemorrhoids, which, from their tendency to bleed profusely at stool, are known as bleeding piles; and when about the verge of the anus, they are known as *external* hemorrhoids. We must not omit to warn our readers against the deceptive and often dangerous practices of many charlatans who, under the title of "Orificial Surgeons," often prey upon the public in a shameless manner, and often do irreparable damage by their reckless and unnecessary surgical procedures, whereby the comparatively well are made ill for life.

The principal causes of hemorrhoids are constipation of the bowels, violent straining at stool, the use of concentrated food, and obstruction to the portal circulation from pregnancy, or from tumors in the abdomen, or disease of the liver.

Treatment.—As palliative means, the most useful measures are simple unguents in cases of external piles; and in cases of internal piles, the use of warm water or linseed-tea enemas before moving the bowels, and a small enema of cold water immediately after. The cool sitz bath, up-spray or douche, and other applications to the anus are also useful. Suppositories of various sorts are also useful for the purpose of allaying irritation. In all cases in which hemorrhoids are developed to such a degree as to be a source of pain and inconvenience or of troublesome symptoms of any sort, a surgical operation is required. Fortunately the removal of hemorrhoids is no longer attended by the suffering and risk which were formerly connected with this operation. Internal hemorrhoids may be removed with very great facility by means of the author's hemorrhoidal snare. Hemorrhoids which involve both the external and the internal structures may be radically cured by complete removal of the hemorrhoidal structures by Whitehead's operation.

Fissure of the Anus.— This is an exceedingly painful affection of the anus, consisting of a small, irritable ulcer just within the opening of the anus, which is commonly the result of rupture of the membrane of the part from straining at stool. It is characterized by a peculiar burning, teasing pain which comes on soon after relieving the bowels, and is extremely persistent.

Treatment.— The treatment of this condition consists in stretching the anus so as to partially paralyze the muscle, by the contraction

of which the ulcer is kept in an irritable condition and healing prevented. A person suffering with fissure should keep the bowels in a soft condition, if necessary using an enema of linseed tea each time the bowels are moved. Relieving the bowels over a vessel partially full of hot water is one of the best means of relieving the pain of the affection.

500.

Itching of the Anus.—This affection is sometimes so inveterate as to make life almost intolerable. Among its chief causes are dissipation, the use of tea, coffee, tobacco, alcoholic drinks, sedentary habits, piles, worms, various skin diseases, and nervous disorders.

Treatment.—Take a sitz bath at 92° five minutes and 85° ten minutes once a day. After the bath, wash the part well with soap, and apply equal parts of alcohol and water, or apply tincture of iodine or sulphur ointment. If worms are present, give the treatment elsewhere recommended for the same.

Abscess Near the Anus.—This form of abscess is not uncommon. High living, irregular and sedentary habits, straining at stool, and general derangement of the health are all causes which may result in abscess near the rectum. It is a curious fact that this form of abscess shows a great tendency to become chronic and little disposition to heal kindly, often resulting in fistula.

Treatment.—As soon as a painful swelling near the anus is felt, go to bed and apply ice or very cold compresses constantly for twenty-four hours. If the soreness and swelling continue to increase, apply hot fomentations to hasten the process. The abscess should be opened as early as possible.

Fistula in Ano.—This very troublesome affection usually results from the preceding. It rarely recovers of itself. There is no danger in curing the affection, even when it is of long standing, as a suppression of the discharge does not result in disease of the lungs in persons whose pulmonary organs are weak, as is popularly supposed.

Treatment.—The affection may be palliated by means of frequent cold bathing and wearing a small quantity of oakum pressed against the part, or a sponge squeezed out of a strong solution of permanganate

of potash; but the only radical remedy is division of the tissues with a probe pointed bistoury, Fig. 500.

Ulcer of the Rectum.—This affection is generally located two to four inches above the anus, and is accompanied by symptoms of uneasiness in the rectum, with dull pain in the back between the hips, and "morning diarrhea." From extension, this disease may result in stricture. Ulcer of the rectum was formerly regarded as a very obstinate and almost incurable malady. It is curable by surgery. Now, however, this condition may be dealt with in a most successful and speedy manner by simple dilatation of the anus, removal of the ulcer, and closing up of the healthy tissues. The patient should be recommended to employ such a diet as will keep the bowels loose.

Stricture of the Rectum.—This affection of the rectum is generally located within two to four inches of the anus. The condition is quite hard to detect, in many cases, especially when beyond the reach of the finger. The treatment of the disease is purely surgical.

Prolapsus of the Rectum—Falling of the Bowel.—This is a condition in which the mucous membrane of the rectum or the whole bowel is pressed out by means of straining at stool. It occurs most often in children and in persons suffering with hemorrhoids.

Treatment.—Keep the bowels soft by a relaxing diet and enemas of linseed tea or milk and water. Have the patient relieve the bowels in a horizontal posture, with the hips supported over the edge of a vessel. Drawing the anus to one side by traction with the hand upon the fleshy portion of the hip is a good measure for prevention. Bathing the prolapsed part with cold water several times a day is also a useful measure. If the rectum does not retract of itself at the end of defecation, it should be replaced by pressure with the fingers over a thin cloth smeared with vaseline or some other fine unguent. In severe cases, an operation should be performed for a radical cure of this distressing condition. A method which has been recently recommended, is the application of a series of ligatures beneath the mucous membrane of the rectum and just above the extruded mass.

Polypus of the Rectum.—The rectum is sometimes the seat of growth of a similar character to those which are found in the nose, as before described. A cure is easily effected by a proper surgical operation.

Treatment.—These tumors are very easily cured by tying a ligature about the neck of the tumor. It usually falls off in three or four days. In the case mentioned above we employed both the ligature and the galvano-cautery.

Paralysis of the Rectum.—This may be the result of general paralysis or of paraphlegia, or partial paralysis may result from the long continuance of piles. The proper treatment is the daily application of electricity and frequent cold applications.

Absence of the Anus.—This is a congenital deformity which should always be looked for in young children, as it is possible to remedy the defect by a proper surgical operation.

Artificial Anus.—The production of an artificial anus is one of the devices of modern surgery for the relief of permanent stricture, or closure of the natural outlet of the bowels from malignant disease.

Use of the Catheter.—The passage of the catheter is in some cases one of the most delicate operations in surgery, but when a gum elas-

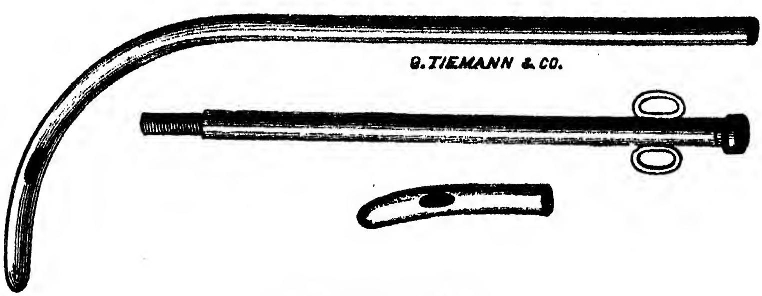


Fig. 501. Catheter.

tic instrument is used, and the instrument is allowed to follow the course of the canal without the application of any very great degree of force, it may generally be accomplished with ease, even by the patient himself. Every person who is at times dependent upon a catheter, should learn the art of using it properly from a skillful surgeon. The passage of the instrument in females is a very simple operation.

Urinary Calculus.—In some cases stony concretions form in the bladder, and attain such a size as to make their removal by a surgical operation necessary. The old operation was by cutting open the base of the bladder; but calculi are now removed by the much less formidable operation of crushing with an instrument similar to the one

shown in Fig. 502. The fragments are washed out by means of a stream of water from a powerful rubber bulb.

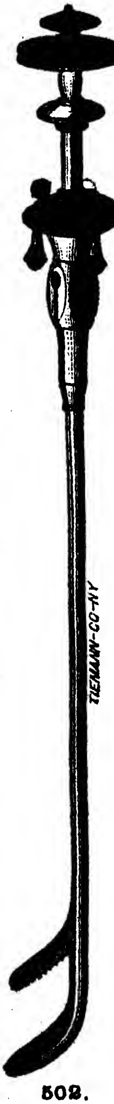
Extroversion of the Bladder.—This is a deformity in which there is failure of the bladder and abdominal walls to close up in the process of development, so that the inside of the bladder is exposed. The principal inconveniences occasioned are those arising from the constant dribbling of urine upon the adjacent parts of the body, which cannot be wholly prevented by any practical means. The defect has been remedied in a few cases by a surgical operation.

Hypospadias.—In this deformity there is an imperfect development of the urethra, which occasions deformity of the penis as well as inconvenience in urinating. This defect may also be remedied in many cases by a surgical operation.

Stricture of the Urethra.—This is a condition in which the urethra is contracted in some part of its length. Stricture is most often the result of inflammation. Its presence is indicated by difficulty in passing urine or ability to pass but a small, weak stream. Sometimes there are two or more streams which are often curved or spiral. There is also usually dribbling of urine at the close of urination, and more or less discharge from the urethra.

Treatment.—The treatment of stricture can be conducted only by a competent surgeon; but it is a matter of great importance that these cases receive prompt attention.

Varicocele.—This morbid condition consists in a varicose state of the spermatic veins. It is almost always found upon the left side, owing to an anatomical peculiarity of the spermatic vein of that side. It has been supposed to be a result of masturbation and its effects, but is certainly caused otherwise in many cases. It is not infrequently found in these patients; but Prof. Bartholow contends that even in such cases, we should "consider its presence, in general, as accidental." Atrophy of the left testicle is often produced by the pressure of the distended veins.



502.

Treatment.—The inconveniences of the disease may be greatly lessened by wearing a suspensory bag; but the best treat-

ment is an operation by means of which a portion of the enlarged vein is removed.

Hydrocele.— This is a dropsy of the testicle. The spermatic cord may also be affected. The tumor usually has a translucent appearance when viewed with a strong light behind it. It differs from hernia in that it cannot be reduced or pressed back into the abdominal cavity, does not diminish during sleep or while lying down, is not increased by coughing, and does not come down from above.

Treatment.—The proper treatment is a surgical operation, which may consist of simply tapping or withdrawing the fluid by an aspirator, and injecting iodine, or laying open the tumor. A surgeon should be consulted.

Phimosis.—This is a condition in which the prepuce, or foreskin, is so tight that it cannot be drawn back over the glans. It is best remedied by the operation of circumcision. In the majority of cases we simply slit up the foreskin to the back side of the glans.

Paraphimosis.— In this condition the foreskin has been drawn back and has become swollen behind the glans in such a manner as to prevent it from being drawn forward. The condition is sometimes a very painful one, the end of the organ becoming greatly swollen.

Treatment.— Grasp the organ between the first and second fingers of each hand and press steadily against the end of the glans with the ends of the thumbs. An operation for the division of tense tissues is sometimes necessary.

Circumcision.— The fold called the prepuce has upon its inner surface glands which produce a peculiar secretion. Under certain circumstances, and from inattention to personal cleanliness, this secretion may accumulate, and then often becomes the cause of irritation and serious disease. To prevent such disorders, and to insure cleanliness, the Jewish law required the removal of the prepuce, which constituted the rite of circumcision.

Castration.— This operation consists in the removal of the testes. It does not at once obliterate the sexual sense, especially if performed after puberty, but of course renders the individual sterile, or incapable of reproduction. Persons on whom it has been performed are called eunuchs.

An analogous operation, termed *spaying*, is performed upon females, consisting in the removal of the ovaries.

APPENDIX,

CONTAINING

A CHAPTER ON HEALTHY HOMES,

DESCRIPTION OF

COMMON POISONS and THEIR ANTIDOTES,

FORMULAS OF

FAMOUS NOSTRUMS AND PATENT MEDICINES, AND 140 CHOICE PRESCRIPTIONS FOR COMMON DISEASES, DIET TABLES, ETC.

MODERN MEDICINE PUB. CO.,
BATTLE CREEK, MICH.

HEALTHY HOMES.

The home is the nursery of the nation; and unless its inmates are provided with the conditions requisite for health, the nation, as well as its constituent families, must languish and deteriorate in physical stamina. This fact seems to have been overlooked, or at least imperfectly appreciated, by many writers on general hygiene, and a disproportionate stress has been laid upon what is termed "public hygiene," a subject of vast importance, and worthy of all the attention it has received, and more; but still, in our opinion, it is of secondary importance when compared with that branch of the great subject of hygiene which may be termed *domestic hygiene.*

The able advocates of the need of general sanitary reforms, such as chiefly concern cities of sufficient size to require water and sewerage systems, cite with great confidence as a conclusive evidence of the paramount importance of public sanitation, the fact that in countries in which statistical records have been carefully kept for a long series of years, it is possible to show an increase in the average length of life which is commensurate with the improvements made in the general sanitary arrangements of cities during the same length of time. It is claimed that the average length of life has been thus increased from about twenty-five years to nearly forty years.

This appears at first sight to be a conclusive showing; but when we carefully investigate the matter, we find that this increase in average longevity is wholly the result of the lessened frequency of such infectious or contagious disorders as typhoid and typhus fevers, small-pox, cholera, plague, etc., which a century ago were responsible for a large part of the entire mortality of cities and thickly settled country districts. While these disorders are by no means exterminated, they now hold a much less conspicuous place in the mortality tables; but consumption and various other constitutional and structural disorders have come to the front as the leading causes of human mortality. At the present time, nearly one-fifth of the total number of deaths occurring annually in this country, is due to consumption,—a very great increase over the death rate from this cause half a century ago.

Another noticeable fact which bears directly upon this question is the lessened number of centenarians now to be found in our city and town communities; while the average length of life has been increased, the chance of an individual's living to great age has been diminished.

The average length of life has been increased by increasing the longevity of the weak and feeble, rather than by adding to the lifetime of the strong and vigorous. Indeed, it would seem that there has been a material lessening of the average longevity of the strong, although this loss is more than balanced by the additions to the lease of life of the feeble. A century ago, epidemics of various sorts, unrestrained by efficient quarantines and other sanitary measures, weeded out the sickly and physically inferior individuals, thus preserving in a purer state the constitutional stock of the strong; whereas, at the present time, the natural operation of epidemics being prevented, the feeble are preserved, and, mingling and intermarrying with the strong, deteriorate their vital stamina, and so lessen their longevity.

This is the natural operation of those sanitary measures which are usually included in the term "public hygiene;" and it seems evident to us that unless something more is done for the physical improvement of the individual, the ultimate effect of public sanitary measures—neglecting individual and domestic hygiene—will be to deteriorate, rather than to improve, the race. Epidemics and plagues act as a means of natural selection, which preserves the strong, and makes them still more vigorous, while sacrificing the weak. Public hygiene is certainly in the highest degree humanitarian and philanthropic, but it does not necessarily follow that its results to the race, considering man as an animal merely, are wholly beneficent.

We trust it needs no further argument to demonstrate the necessity for the hygienic care of the individual, as well as of the community. By this means the feeble will not only be preserved alive, but will be so improved that the feebleness may be outgrown; the hereditary tendency to pulmonary disease may be overcome; the seeds of transmitted disorders may be kept from germinating until they are finally obliterated; and thus the race may be improved, rather than deteriorated.

It needs no argument to establish as a fact the statement that one of the most essential things for the maintenance of individual health is a healthy home. Let us now inquire—

What Constitutes a Healthy Home?—The essentials of such a home are, 1. A salubrious location as regards the surrounding country; 2. A healthful site as regards position, soil, etc.; 3. A properly constructed house, with proper arrangements for heating, ventilation, and admission of sunlight; 4. A copious and pure water-supply. Some phases of these subjects have been so elaborately treated in the body of this work, we need not devote much space to their consideration here.

Best Location for a Home.—The questions which usually come up for consideration in connection with selecting a location for a home are those

which relate to convenience or pecuniary profit, rather than health. The first question should be, Is this a healthful location? Are there in connection with this spot, either immediate or remote, any serious causes of illness or grave disease? If the location is known to be especially malarious in character, this alone should be sufficient to condemn it, as this poison is one of those which produce, not only serious, but often fatal, acute diseases, such as ague, remittent or bilious fever, pernicious intermittent fever, but may lay the foundation for chronic constitutional disorders which may baffle the skill of the wisest physician so long as the patient remains exposed to the exciting cause. Malaria is, unfortunately, not confined to a few sections of the country, but is more or less prevalent in every part of the United States; yet there are plenty of eligible locations for homes where this class of disorders does not prevail except under specially unfavorable conditions, and then infrequently, and not in the most severe forms. A man can readily afford to sacrifice much pecuniarily rather than subject himself and his family for years to the influence of a subtle poison which may not only involve much inconvenience and suffering, but even loss of life.

If circumstances compel the selection of a home in a malarious locality, care should be taken to ascertain the probable source of the poison, which will very likely be marshy or low land covered with water in the spring and becoming dry during the summer. A mill-pond or a lake with much low, flat land adjoining should be regarded with suspicion. The direction of the prevailing wind should next be ascertained. In most parts of the United States, the most prevalent wind is that from the south-west, especially during the summer season.

These two points having been satisfactorily settled, let the spot selected for building be located in such a manner that it shall be between the source of malaria and the prevailing wind; that is, in most parts of this country, a house, if near a swamp, mill-pond, or other suspicious locality, should be situated at the south-west of it, if possible, and under no circumstances at the north-east, as the south-west wind would then come to it across the malarial tract, and consequently be laden with the poison.

As the wind does not always blow from any one direction, it is important to take the further precaution of so situating the home as to have between it and any source of malaria a considerable space covered by a dense growth of trees, as it has been found that forests intercept and to some degree destroy the malarial poison.

A Healthy Building Site.—After the immediate locality for a home has been determined upon, the selection of the very spot upon which to place the house is still a matter of no small consequence. Shall the site be level, or upon a hill-side? Shall the house front east, south,

west, or north? What sort of a soil is best to place it upon? All these are questions of importance as regards the health of those who are to occupy the home. Let us answer each as concisely as possible.

It is very important that there should be good surface drainage in the vicinity of a dwelling, not only to afford easy means of disposing of the waste water of the dwelling, but to carry away quickly the water which falls in heavy rains in excess of the ability of the soil to absorb, and the melted snow in spring, which the frozen ground cannot take up. No opportunity for stagnant water should be allowed about a dwelling. This being true, it is evident that the center of a knoll or gentle rise of ground, from which the surface slopes in every direction, is a most desirable spot for a dwelling-house. A south hill-side will be preferred by some, however, as it not only secures good drainage, but protection from the cold northern and north-eastern winds in winter, and a greater amount of sunlight and heat.

A dwelling-house should always front the east or south, if constructed after the usual plan of dwelling-houses, so that each of the chief rooms of the house may receive a flood of sunlight at some time during the day.

Best Kind of Soil to Build Upon.—A porous soil possesses great advantages over any other, although such a soil is subject to some conditions out of which grow evils not presented by a less pervious soil. Perhaps it may be allowed that an absolutely impervious surface, as that of solid rock, would be best of all for a building site; but aside from this, we must accord the chief advantages to a soil which is freely porous, as sand or gravel. Next in order are the several varieties of loam; and last to be mentioned, as least salubrious—unless extraordinary advantages are afforded for surface and underground drainage—is clay and other soils which hold water in great quantities. The reason for the different values of these various soils from a health standpoint becomes apparent when we study the properties of—

Ground Air and Water.—Everybody knows that water is to be found in the earth in most localities, sometimes near the surface, and in other places and at other times far beneath the surface; but not all are so well aware that air exists in the soil, usually in a much greater quantity than water. All soils, not excepting the most compact, and even the solid rocks, are pervious to both air and water in some degree. A loose, gravelly soil admits both air and water in very large quantities.

The porosity of the soil may be readily shown by a simple experiment. In one end of a large glass tube eight or ten inches in length—an Argand lamp chimney will answer the purpose admirably—fit closely a new cork. Perforate the cork in the center, and insert a small glass tube. Now place in the end of the large glass tube next the cork a

small quantity of cotton, and fill the tube with earth. The latter should be perfectly dry. A little cotton may be placed in the open end of the tube to keep the earth from running out. If the open end of the tube is placed in the mouth while the small glass tube at the other end is held near a candle flame, it will be observed that by blowing into the open end of the tube the flame may be made to flicker, showing that the earth in the tube is pervious to air.

The air in the soil is known as *ground air.* After a heavy rain the earth may be saturated with water, which gradually settles, some portion being carried off underground, and much evaporating from the surface. The level of the water, which was immediately after the rain at the level of the ground, gradually falls, and the air is drawn into the porous soil as the water sinks. Another rain will raise the level of the water, and crowd out an equal amount of air. This varying quantity of water in the soil is known as *ground water.*

The hight of the ground water and its variations in any locality may be approximately determined by the measurement of the depth of water in wells, which usually varies with the ground water. The water in the soil is usually in motion, the direction of movement being toward some neighboring stream or other large body of water. The rate of movement varies from a few inches to several feet daily.

The ground air is also in constant motion. This is in part the result of the movements of the ground water, and is partly due to the action of the wind. Other causes also operate to produce movements in the ground air, as we shall see. When the wind blows against the side of a hill, a portion of the ground air in the hill is displaced by air driven into the ground by the wind, the old air being forced out at the opposite side of the hill at the same time.

Relation of Ground Air and Water to Health.—Both ground air and ground water are at best more or less impure. Ground air, especially, contains a number of impurities which are dangerous to health. Carbonic acid gas is present in very considerable quantities. These impurities are the result of organic decomposition. A great amount of animal and vegetable matter is constantly undergoing decay upon the surface, in the warm months of the year, and this is washed down into the soil by the rains, where the same processes of decay continue, being favored by the constant moisture and comparatively uniform temperature which exist a short distance below the surface in most soils. Every rain washes down into the ground water some of the products of decay, and brings other decomposing and decomposable substances to deposit in the soil.

An understanding of the nature of ground air and water at once shows the importance of avoiding ground air as much as possible, and

regarding ground water with suspicion. As it is impossible entirely to avoid contact with either, it is important to protect from contamination the ground air and water in connection with dwellings so far as possible.

Construction of a Dwelling-House in Relation to Health.—As regards health, the construction of a house should be such as to secure proper protection from cold in winter, excessive heat in summer, rain and wind at all times, and to secure an abundance of light and air. The materials of which a dwelling-house is constructed may be suited to the means and convenience of the builder. Wood, brick, and stone are in this climate the chief materials used, and it is a matter of comparatively little moment, so far as health is concerned, which one is employed, provided the materials used are properly put together. Brick and stone houses should always be constructed with hollow walls, and care should be taken that the space left between the courses of brick or stone is not filled up with fragments and mortar so as to become useless, as is often the case.

Living and Sleeping Rooms should be Large and Airy.—Sleeping-rooms in particular are too often made quite too small for health. The hight of rooms should be not less than nine or ten feet, and not less than twelve hundred cubic feet of space should be allowed in sleeping rooms for each individual. This would require for a bedroom intended for one person, a room ten by twelve feet on the floor, and ten feet high.

The window space, to insure an ample supply of light and sunshine, should be not less than one-third of the floor space. That is, a room 10 x 12 feet on the floor should have three windows, each $2\frac{1}{2} \times 5\frac{1}{2}$ feet, or two windows each 3 x 7 feet.

Chambers, sitting-rooms, parlors, and all rooms which are much occupied, should be so placed that they may receive daily an abundant supply of sunlight; and the direct rays of the sun should not be intercepted by overhanging trees, or by curtains or blinds. Curtains and blinds are not objectionable when properly used; but the exclusion of sunlight is no part of their proper service, only under exceptional circumstances.

A light, airy, roomy kitchen is conducive to the health of those who are employed in this department of a dwelling. Pantries and closets are not objectionable if so situated that the sun may shine into them often. When dark, they speedily become musty and infected with mold and mildew. The fusty odor which so often haunts these places is indicative of the need of air and sunshine.

How to Ventilate a Home.—In the construction of a dwelling, attention should be given to ample provision for the adequate supply of fresh and pure air. It should be recollected that each person requires not less than forty to sixty cubic feet of pure, fresh air per minute, or 2400 to

3600 cubic feet per hour. To secure this amount of air requires for each person an opening not less than one-sixth of a square foot in area, and absolute safety requires a still larger area. Some fresh air will find its way in through cracks, between window sash, under and around doors, and even through brick walls; but this is an uncertain and inadequate supply, and openings should be provided at convenient places for this purpose.

If provision for the proper ventilation of a house is made at the time of its construction, very little expense need be involved; hence the importance of giving this matter attention when planning a dwelling. The following is a brief summary of the principles of correct ventilation, which ought to be familiar to every one, whether interested in house-building or not:—

1. For efficient ventilation of each room in a building, two openings are necessary, one for entrance of fresh air, and one for egress of foul air.

2. When the fresh air enters a room warm, as when furnaces are used for heating, the foul air opening should be at the bottom, as the oldest air in the room, and consequently the most impure, will be that which has been in the room the longest, and has been gradually cooled by contact with outside walls and window surfaces. When a room is heated by stoves, the foul air opening should be near the ceiling.

3. The size of openings depends upon the number of persons to be supplied with air. It may be laid down as a general rule that an opening of twenty-four square inches' space in both inlet and outlet is required for each individual in a room. The openings should be of sufficient size to allow a passage of at least three thousand cubic feet of air per hour without creating too perceptible drafts. Air cannot travel through a room more rapidly than five feet a second without a current being perceptible. A sick room needs two or three times the ordinary amount of ventilation.

4. The foul air openings of rooms should connect with heated ventilating shafts. Cold-air shafts are uncertain ventilators. They are not to be relied upon. The amount of draft in the shaft depends upon the hight of the shaft and the amount of heat in it. Various methods of heating the ventilating shaft may be adopted. In a building heated by steam, steam pipes may be employed. In ordinary dwellings, the waste heat of smoke-pipes or chimneys may be utilized for the purpose. An oil-stove or a gas-jet may be used for heating small shafts in dwellings; or a small stove may be used to accomplish the same purpose in larger shafts.

5. Rooms on different stories should not open into the same ventilating-shaft, as the upper rooms are certain, under various circumstances, to receive the foul air from the rooms below.

How to Heat a Home.—Proper heating, which is closely connected with ventilation, is by no means so simple a matter as may be supposed by those who have given the matter no special attention. A properly heated building is as rarely to be found as one which is efficiently ventilated. Heating by stoves is the method in most common use, and as ordinarily employed, is, next to the method of heating by means of steam pipes placed in rooms and not regularly supplied with fresh air, the most unhealthful. The stove simply heats the same air over and over, providing no fresh air. On this account it is to be condemned, unless such a device as is described on page 565 of the body of this work is employed to remedy the defect.

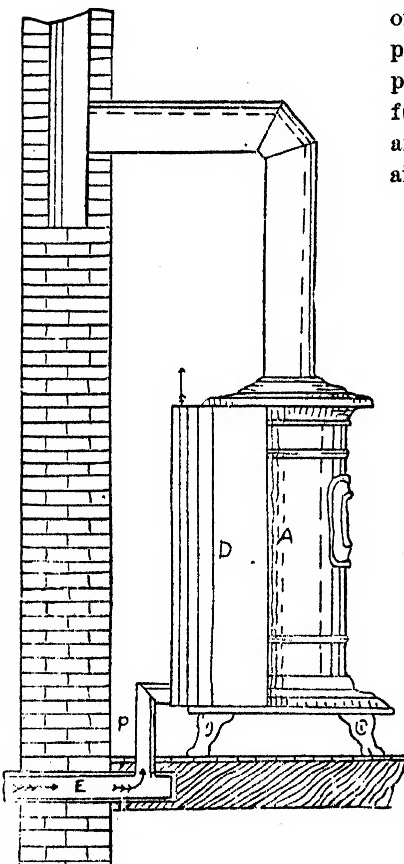


Fig. 1.

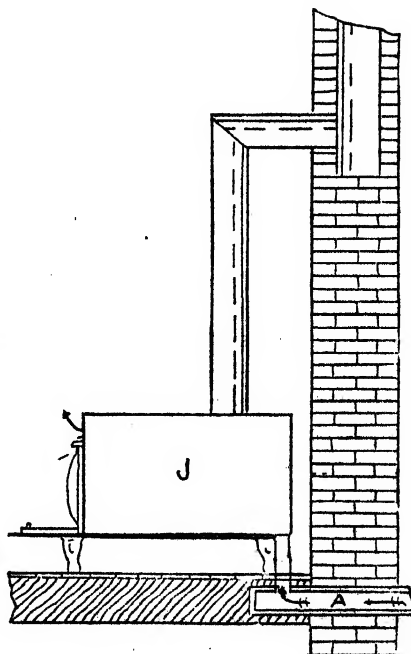


Fig. 2.

For ordinary use in dwelling-houses of any considerable size, the furnace is undoubtedly the most healthful and economical means of heating. It should be mentioned, however, that a furnace is useless without efficient means of ventilation. Air cannot be made to enter a room unless room is made for it by the removal of air. A plan which is

sometimes employed, and which has been highly recommended by those who have tried it, is the following: The furnace is placed in the cellar, from which the supply of air is taken. A hot air duct leads to the room

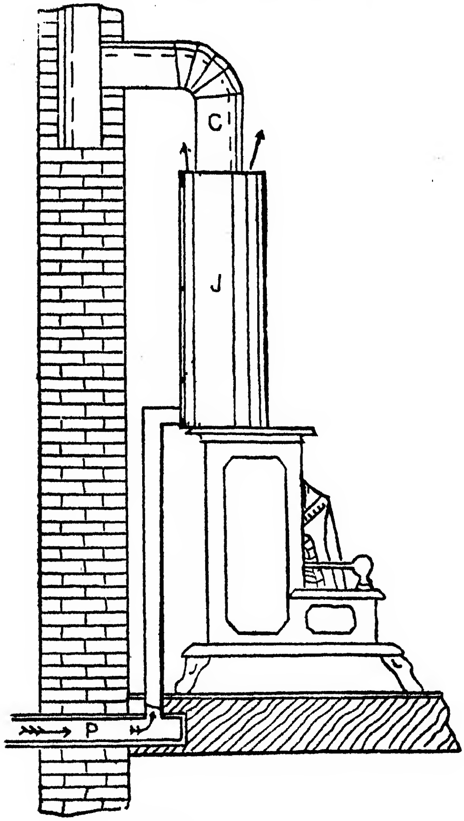


FIG. 3.

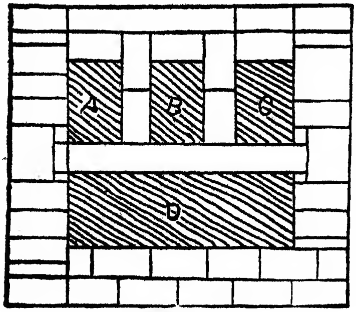


FIG. 4.

or rooms to be heated, and another register is put in the same room, at a distance from the hot-air register, through which the cold air of the room may be taken back to the cellar, and thence to the furnace. By this arrangement, the same

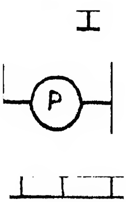


FIG. 5.

air is made to travel round and round, and a very great economy in fuel is secured. Such an arrangement as this is the very worst possible, and cannot be too strongly condemned. Air to supply a furnace should come direct from out-of-doors, and the same should be said of stoves arranged after the methods shown in the accompanying cuts, for the designs for which we are indebted to our friend, the Rev. D. C. Jacokes, who has devoted much time and patience to the development of simple means for providing efficient ventilation for common dwellings and country churches and school buildings.*

*Dr. Jacokes contributed a valuable paper on this subject to the annual report of the State Board of Health of Michigan for 1880, of which he was then a member. This paper was widely copied, and has undoubtedly been the means of accomplishing untold good. The designs are taken from it.

Novel Devices for Ventilation.—Fig. 1 shows how a common stove, A, by the addition of a sheet-iron jacket, D, which communicates with the open air through a pipe, P, and a wooden box, E, passing beneath the floor through the foundation wall, may be made to supply warm, fresh air to a room almost as efficiently as a furnace.

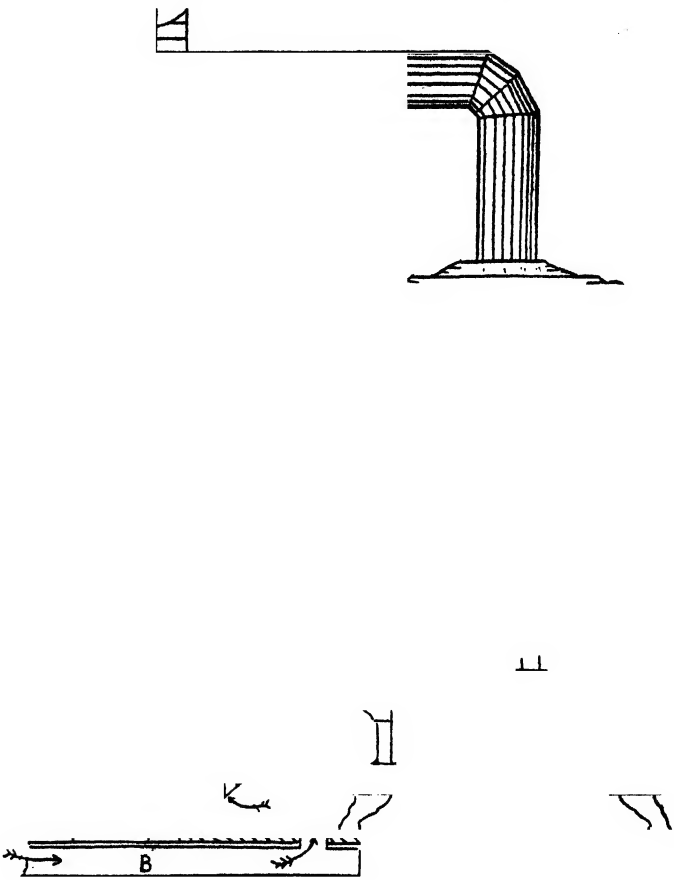


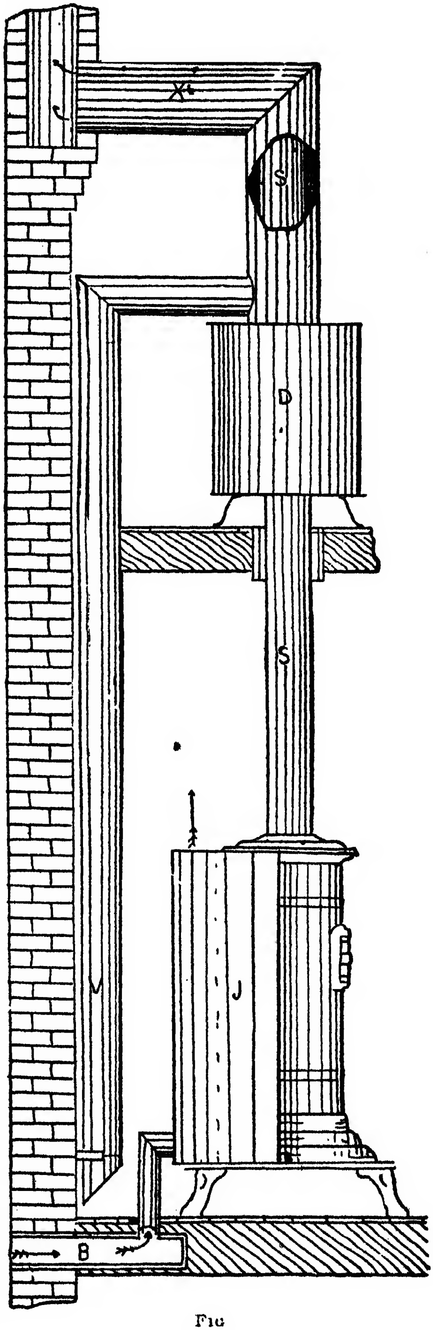
FIG. 6.

Fig. 2. This is a similar arrangement applied to a box-stove. Any kind of stove may be arranged in the same manner. If preferred, the stove may be located in the basement, and completely inclosed by the jacket, when it becomes practically a furnace. When thus arranged, a pipe of ample size should lead from the top of the jacket to a register in

the floor of the room to be heated. With a good-sized stove thus arranged, two or three rooms may be sufficiently heated, even in very cold weather. Care must be taken to arrange the fresh-air opening so that it will not be prevented from operating efficiently by adverse winds.

Fig. 3 shows how the same principle may be applied in a jacket placed about a stove-pipe. It should of course be recollected that none of these methods are effective unless some means is provided by which the foul air may escape from the room.

Fig. 4 shows how a chimney may be so constructed as to operate both as a ventilator and a smoke flue. D represents the smoke flue; A, B, and C, the ventilating flues, which are separated from the smoke flue by a brick or sheet-iron partition, which is heated by the smoke and hot gases in the smoke flue, and thus secures a draft in the ventilating flues. The same result may be secured by carrying the smoke off by means of a pipe or stack carried up through the center of the chimney (see Fig. 190, page 565, of the body of this work), by means of which the air inside the chimney will be heated, and an excellent draft secured. All that remains to be done is to connect each room to be ventilated with the chimney by means of a duct of proper size, which should open at the floor of the room. If two stories are to be ventilated, the chimney space may be divided by a partition, as shown in Fig. 5, C,



Fig

chimney ; P, pipe in center. One side should be used for the lower, the other for the upper story.

Fig. 6. This cut illustrates a means by which a constant supply of warm, pure air may be obtained, and efficient ventilation secured by simple and inexpensive means which are applicable to any house. The arrangement of the jacket and fresh-air pipe are the same as shown in Fig. 1. In addition is seen pipe V, which starts near the floor behind the stove, and is connected with the chimney just below the entrance of the smoke pipe into the chimney. This arrangement gives perfect satisfaction when the chimney is large and the draft strong and constant. It cannot be relied upon when the draft is deficient, as it will diminish the draft of the stove so as to cause smoke to enter the room.

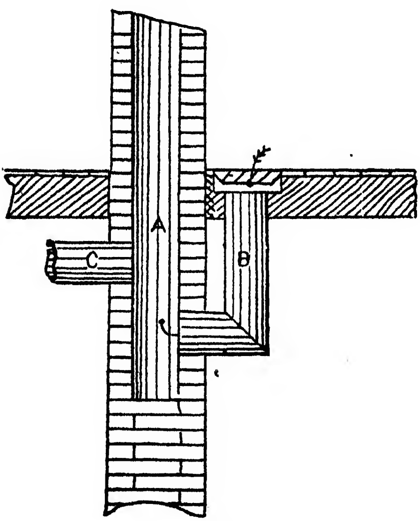


FIG. 8.

Fig. 7 shows an ingenious method of heating two rooms and ventilating one of them, utilizing the heat of the stove-pipe in the second story to create a draft to ventilate the room below. It will be observed that only the lower room is supplied with fresh air. This defect might be remedied by a small register in the floor of the upper room just over the stove of the lower room. Ventilation for the upper room, with such an arrangement as this, must be provided in some other way.

Fig. 8 shows how a room may be ventilated by taking the air down through a register in the floor through a pipe, B, to the chimney flue, A. It will be observed that the opening of the ventilation pipe is below C, which represents the smoke pipe from a furnace. If the ventilation pipe were to enter the chimney above the smoke pipe, smoke would enter the room above. Both of the arrangements last described and illustrated by Figs. 7 and 8 require a very strong draft.

In constructing a dwelling-house with reference to health in the matter of heating and ventilation, we know of no better plan than to provide an improved form of furnace as a means of supplying warm, pure air, and a grate for every room or suite of rooms as a means of ventilation. In very cold weather, the draft in open grates will be sufficiently strong

to secure ample ventilation, if the flues are in inside walls; but in spring and fall a little fire will often be needed to create a draft in the grate flue.

For further information on this subject, see pages 559 to 572 of the body of this work.

Cellars and Basements.—Inattention to the relation to health of cellars and basements, or the space under a house and between it and the ground, is a very prolific cause of a variety of serious ailments. We shall not now dwell upon the evils resulting from contamination of the air through decomposable substances stored in cellars and basements, or accidentally deposited under a house, as this part of the subject has been fully considered elsewhere in this work (see page 551). We wish to call especial attention to the danger which may arise from dampness and ground air entering by the cellar or basement.

Unless the walls of a cellar or basement are made impervious, the ground water and dampness from the soil will be sure to find its way through. Stone walls several feet in thickness are readily penetrated by moisture. The walls of basements are also kept moist by what is known as sweating, which is really condensation of moisture upon the walls from the air, due to the walls being colder than the air which comes in contact with them. The only remedy for these two evils is to make the walls of basements impervious, and to make them good non-conductors by means of an air-space. The walls should be laid in good cement, and should be coated with cement outside as well as inside. The air-space may be made by means of an inside brick lining or a lining of lath and plaster. The air-space should in any case be ventilated, openings being made through the lining so as to allow a good circulation of air between the two walls. A simple wainscoting of matched ceiling answers a very good purpose for use as a lining for basements.

The floor of a cellar or basement must be made as impervious as possible. A floor of asphaltum would undoubtedly fulfill the needed conditions most perfectly; but a Portland cement floor, troweled down smooth and hard, or a tile floor, gives very satisfactory results.

The use of a drain tile all around the building just outside and near the foot of the foundation wall is undoubtedly of great service as a means of disposing of surplus moisture in the soil, especially during and after heavy rains; but in heavy soils this alone is not sufficient. Drain pipes are no protection against ground air, which, as we have already learned, is always impure and unwholesome, and may be rendered in the highest degree noxious and deadly by contamination from privies, cesspools, defective drains, etc.

When the above precautions respecting the construction of cellar and basement walls are neglected, as they usually are, a dwelling is liable to be at any moment, or all the time, flooded with foul air from the surrounding soil. Every open door or window in such a house is a source of draft which sucks in through the cellar walls and bottom mephitic gases, which do their work of death unseen and unsuspected. Every rain storm, every wind, drives into the house floods of these poisonous, subterranean gases. Typhoid fever, diphtheria, probably dysentery, cholera morbus, and possibly many other diseases, are communicated in this way.

Cellars and basements should under all circumstances be well ventilated, and this will do much toward lessening the danger of injury from ground air or ground water should they find entrance. Properly constructed, a basement should add to the healthfulness of a dwelling.

Pure and Plentiful Water Supply.—One of the most essential of all conditions requisite for a healthy home is an abundant supply of pure water. Whether the source of supply is a well, a spring, a lake, or a stream, is a matter of comparative indifference, so long as it is pure and soft. Spring-water justly stands high as a source of water supply, and yet the mere accident of its coming to the surface of the ground does not necessarily give it superiority over well-water. Both waters have essentially the same origin, and the same average composition. Very hard water, and water impregnated with alkalies or other mineral elements, and especially water containing organic matter, cannot be used any length of time without grave injury to health.

A family living in a home favorably located and properly constructed, and provided with an ample supply of pure air, pure water, and suitable food, with proper clothing, and such advantages for mental and moral culture as most civilized communities afford, ought to be both healthy and happy. The doctor will rarely need to visit such a home in his professional capacity, and disease will long fail to make any successful attack upon the happy circle.

POISONS.

(SEE ALSO PAGES 1440-1445.)

MINERAL POISONS.

Chlorine.—This is a gas having a greenish yellow color and a pungent, suffocating odor. It is frequently employed in fumigating buildings, being an excellent disinfectant. It is also used for bleaching purposes. When inhaled, even in a diluted state, it excites great irritation of the air-passages, cough, difficulty of breathing, and subsequent inflammation.

Treatment.—If a person has been overcome by inhalation of chlorine, remove him at once to the open air. Apply ammonia to the nostrils as a chemical antidote, also allow the patient to inhale ether, and the vapor of warm water as soon as possible. Artificial respiration should be employed if the breathing is suspended.

Hydrochloric Acid possesses much the same properties as chlorine. It is of such an irritating nature, even in very greatly diluted form, that it is capable of dwarfing or destroying vegetable life, on which account the regions surrounding chemical works in which it is produced are often barren for some distance.

Sulphurous-Acid Gas and Nitrous-Acid Fumes may also prove fatal, the latter in quite small quantities.

The patient should be taken into the open air as quickly as possible, and artificial respiration applied if breathing is suspended. To relieve the subsequent inflammation, have the patient inhale the vapor of warm water with a steam inhaler. In severe cases the inhalation should be kept up for several hours.

Ammonia Gas.—When quite concentrated, this may produce violent inflammation of the air-passages, followed by pneumonia. Injury is most likely to be done in the use of ammonia in cases of fainting or of narcotic poisoning. If applied at once, the vapor of warm vinegar would be of service in neutralizing the effects of this caustic gas. The continued inhalation of steam constitutes the best treatment. When severe bronchitis or pneumonia follows, they should be treated as elsewhere directed. Ammonia should never be inhaled from a bottle. A few drops at a time should be placed on a handkerchief, so that it may be well mixed with air.

Carbonic-Acid Gas.—This gas, more properly known as *carbon di-oxide*, is not an infrequent source of death. It is the principal product of combustion. It possesses no irritating properties, but sometimes destroys life by depriving it of the proper amount of oxygen. It is found in large quantities in coal mines and many caves. It is also present in large quantities in beer vats, where fermentation is going on, and is given off in immense volumes from lime kilns. Human respiration is also an important source of this poison. In France the gas is frequently used for suicidal purposes. A person confining himself in a close room with an open charcoal fire is soon suffocated. When inhaled in a pure state, carbonic-acid gas produces death by asphyxia. When diluted with air, it produces giddiness, tendency to sleep, and great weakness. The face and hands are livid, the patient becomes comatose, and dies from paralysis of the heart.

Treatment.—Remove the patient to the open air, or an airy room with windows open. Pour cold water upon the head and over the body, then rub briskly with flannel cloths. Make hot and cold applications to the spine. Employ artificial respiration. The application of galvanism, and the inhalation of oxygen gas should be employed when possible.

Carbonic-Oxide Gas.—This gas is the product of imperfect combustion. It is always present in coal gas, and is its chief poisonous element. It is also produced in the burning of coal in stoves, and also in the burning of wood whenever the draft is checked, on which account dampers in stove-pipes, or anything which impedes the draft, should be looked upon as dangerous. This gas is so poisonous that it may produce deadly effects, even when very much diluted with air. Its effects sometimes prove fatal two or three days after an individual has been rescued from its influence.

Treatment.—There is no true antidote for the effects of this deadly gas. The patient should be treated the same as in poisoning by *coal gas*, which see.

Sulphureted Hydrogen.—This gas may be known by its peculiar odor, which is that of rotten eggs. It is present in large quantities in sewer gas, and is probably the cause of the nausea, giddiness, and weakness frequently suffered by workmen engaged upon old drains and sewers. When inhaled in considerable quantities, the only hope for recovery is by removal immediately to the open air, the application of artificial respiration, and friction to the surface. In severe cases no human aid is of any avail.

Coal Gas.—This gas is very poisonous when inhaled, even though considerably diluted with air. If the quantity inhaled is considerable, asphyxia is produced. If inhaled more slowly, the effects are intense

headache, labored respiration, increased action of the heart, nausea, and great debility. There is great danger from poisoning by this gas in houses in which there is a leak in the gas pipes. Many persons have been poisoned by blowing out the gas at night in a sleeping-room, instead of turning it off. Some years ago a whole family in Strasbourg was poisoned by the escape of gas from a leaky pipe which passed under the cellar of the house. Probably the poisonous effects of coal gas are largely, if not chiefly, due to the carbonic oxide present in it. The new gas which is being largely introduced of late in the cities, known as "water gas," contains a very large proportion of carbonic oxide, and hence is more dangerous to health. Danger from this source of poisoning may be largely obviated by the use of gasoline gas, which may be inhaled in considerable quantities when diluted, without producing serious symptoms.

Treatment.—Remove the patient to the open air as quickly as possible. Apply artificial respiration and appropriate measures for stimulating the circulation. Cold effusions should be applied to the head, and hot and cold applications to the spine. The application of the hot fomentation over the heart will be found useful in these cases. In attempting to rescue persons overcome by gas, it should be recollected that the amount of gas present in the air of the room may be sufficient to render it explosive; consequently, no light should be taken into the apartment until after the doors and windows have been opened to allow the gas to escape. Neglect of this precaution has sometimes resulted in serious explosions. This precaution should be borne in mind by a person awaking in the night, and finding his room filled with gas.

Phosphorus.—Phosphorus is a constituent of many preparations used for poisoning rats, cockroaches, and other vermin. It is also contained in phosphorous matches, and is a violent poison, producing death in very small quantities. A child has died from sucking two matches.

Treatment.—There is no antidote to this poison. When it has been swallowed, the stomach should be emptied as quickly as possible by an emetic consisting of one or two teaspoonfuls of powdered mustard or alum in a goblet of warm water, followed by large quantities of thin gruel. Oils should be avoided.

Poisonous Fabrics.—Various compounds of *arsenic* are used in coloring fabrics of various kinds, such as tarlatan, carpets, mats, etc., together with wall-papers, window curtains, toys, wafers, etc. The colors most apt to be poisonous are the different shades of green and drab, although Dr. Kedzie, professor of chemistry in the State Agricultural College of Michigan and late President of the State Board of Health, has shown that other colors are also sometimes poisonous.

Fabrics colored with *aniline* are often rendered poisonous by the use of arsenic in the coloring process. Poisonous effects are frequently derived from colored socks, flannel under-garments, hat and boot linings.

Poisoning is said to have been occasioned in a few instances by the use of American leather, which has been found to contain large quantities of lead. The principal dangers from this source have arisen from its use for hat linings, and lining of baby carriages.

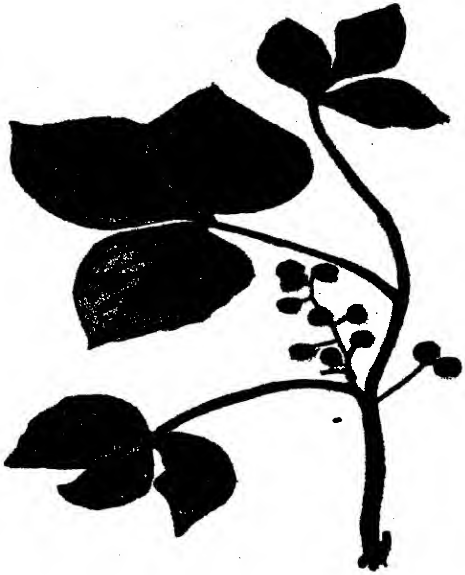
Poisonous Cosmetics.—Hair dyes and restoratives are frequent sources of poisoning on account of the great quantities of lead which they almost always contain. We have met instances of lead palsy which had been occasioned be their use. Arsenic has also been used for coloring the hair yellow. No doubt serious results may follow the employment of arsenic in this way.

Lotions and powders for the face generally contain lead in addition to various other substances. In some, corrosive sublimate, a compound of mercury, is the chief constituent. All of these are, of course, in the highest degree poisonous. If any preparation is to be used for the face, some simple and harmless substance, such as carbonate of magnesia or wheat starch should be employed. Starch and oxide of zinc, in proportion of eight parts of the former to one of the latter, makes a very excellent white powder for the face. Carbonate of magnesia, colored with one-fourth part of carmine red, will answer all purposes as a red powder. We have seen very serious cases of lead poisoning produced by the application of preparations of lead to the face.

POISONOUS PLANTS.

The Nettle.—This a common name for a number of different plants which are covered with hairs capable of inflicting a stinging wound by means of an acrid juice which contains formic acid, a very irritating and poisonous substance. The same acid is also found in caterpillars and red ants, which are capable of producing the same kind of injury occasioned by the nettle. The virus of bees, wasps, and hornets contains the same substance. The nettle sting produces a white spot, surrounded with a red swelling, and is accompanied by a peculiar and very severe itching and tingling.

Treatment.—Apply a solution of baking-soda, one teaspoonful to six tablespoonfuls of water. A still better preparation is the following: Carbolic acid, a teaspoonful; glycerine, two tablespoonfuls; ammonia, a tablespoonful; and water, half a pint. This may be kept on hand in readiness for use. It is also excellent for the stings of bees and other insects.

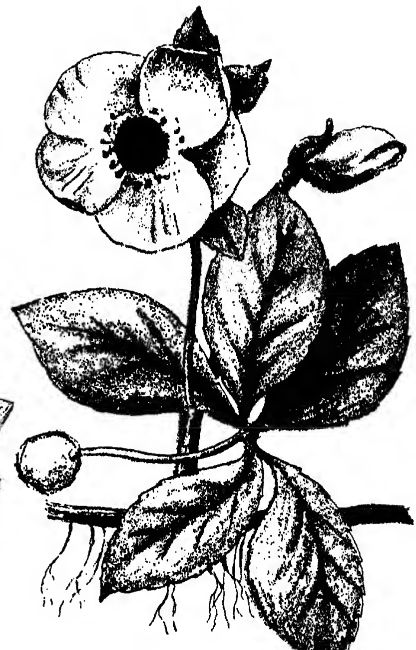


Poison Ivy. (Rhus Toxicodendron.

Stramonium.

PLATE XVII.—*POISONOUS PLANTS.*

Fox Glove.



Black Hellebore.

PLATE XVIII.—*POISONOUS PLANTS.*

Poison Ivy.—Plate XVII. This is a climbing plant with three leaflets. It is also known as three-leaf ivy and poison vine. It is an exceedingly poisonous plant, many persons being affected by simply coming in its vicinity and without touching it. The symptoms very closely resemble those of erysipelas of the skin. There is swelling and redness, attended by intense burning and itching. In some cases, vesicles, or small blisters, are formed. The poisonous parts of the plant contain a volatile substance known as *toxicodendric acid.*

Treatment.—Alkaline solutions of various sorts are the most effective remedies. Dilute ammonia water, a strong solution of baking-soda, weak lye, lime-water, and in the absence of anything better, soft soap may be employed. A remedy which is highly commended is equal parts of lime-water and a strong decoction of oak-bark. A bandage should be wet with the solution and applied to the parts, being removed as often as it becomes dry. A person who has been severely poisoned by ivy sometimes suffers a frequent recurrence of an itching eruption. This is not due to a retention of the poison in the system, but is a form of eczema, or moist tetter, and should be treated by the remedies recommended for this disorder of the skin. See page 1263.

Swamp Sumac, Poison Dog-Wood, or Poison Elder.—These are different names for a branching shrub which grows in swamps. Its usual hight is from six to eighteen feet. It rarely grows over eighteen feet in hight. It has smooth branches, and a compound leaf composed of seven to thirteen leaflets.

The symptoms are the same as in poisoning by poison ivy. The treatment is also the same.

Poison Oak.—This is another variety of rhus, the symptoms of which are similar to those of the two preceding varieties. The treatment is also essentially the same. The extract of *grindelia robusta*, a California plant, is recommended for poisoning with poison oak, which is a native of the same State. It should be rubbed upon the poisoned part.

Stramonium, Jamestown Weed, or Thorn Apple.—Plate XVII. This is a very common plant, which grows to the hight of from three to five feet. It has a large white flower, and bears a fruit about as large as a small peach and covered with sharp spines. Parts of the plant are poisonous, particularly the fruits and seeds. Soon after any portion of the plant is taken, faintness, partial paralysis of sensation, dilatation of the pupils, and dimness of vision are experienced. The pulse is slow and the head congested. Very frequently there will be some delirium and various illusions. The patient is generally unable to walk, or walks with a staggering gait.

Treatment.—Give a teaspoonful of ground mustard or powdered alum

in a goblet of water, and let the patient drink freely of warm water or strong tea. The tea is to be taken for the benefit of the tannin which it contains. A decoction of oak-bark is equally useful. Four to eight teaspoonfuls of powdered charcoal should be given. The charcoal may be powdered by pounding in a cloth. It is best taken by mixing with a little milk, or glycerine and water. If there are symptoms of collapse, hot and cold applications should be made to the spine, and the surface should be vigorously rubbed with hot flannels, or hot alcohol or vinegar.

Indian Poke.—This plant grows in wet soil to a hight of four to six feet. Its roots are of a bright green color, and its flowers a greenish yellow, appearing in May and June. The variety of the plant known as white hellebore, not a native of this country, is used for poisoning insects. The symptoms of poisoning with hellebore are a slow, feeble pulse, which sometimes becomes almost imperceptible, great prostration, cold moist skin, dizziness, nausea or vomiting, dimness of vision, faintness, and sometimes stupor.

Treatment.—Administer an alum or mustard emetic. Make the patient drink copiously of hot teas; strong camphor or peppermint tea is especially useful. The patient should be kept quiet. Hot bricks or bottles should be applied to the extremities, and hot fomentations over the region of the heart. Alternate hot and cold applications to the spine, especially between the shoulders, are also very serviceable.

Black Hellebore, or Christmas Rose.—PLATE XVIII. The symptoms of poisoning by this plant are severe pains in the bowels, vomiting and purging, dizziness, cold sweats, and collapse similar to that of cholera. The infusion of this plant has been employed by quacks as a vermifuge, and in several instances with fatal consequences. Treatment the same as the preceding.

Fox Glove, or Digitalis.—PLATE XVIII. This plant is often cultivated for its flowers. Its seeds, leaves, and roots are very poisonous. The symptoms arising from a poisonous dose are vomiting, purging, colic, headache, slow and irregular pulse, dilated pupils, dimness of vision, great prostration, convulsions, and coma. It is frequently used in medicine. Cases of poisoning not infrequently occur from its medicinal as well as from its accidental use, owing to its cumulative effects.

Treatment.—Give the patient an emetic at once, and afterward strong tea, or a decoction of oak-bark. The tannin contained in the infusion neutralizes the poisonous principle of the plant, and so renders it inert. Powdered charcoal may also be administered in milk. These remedies are of course useful only in antidoting that portion of the poison which still remains in the stomach. Other measures, the same as recommended for Indian Poke, should be employed.

Hemlock, Poison or Spotted Hemlock.—This is a shrub which grows to a hight of three to five feet, and very much resembles parsley in its appearance. The stem is hollow, and covered with purplish spots. It bears white flowers, which have a peculiar fetid odor. The seeds are the most poisonous part of the plant. The poisonous principle of hemlock is conium. It is used in medicine. The symptoms of poisoning are great weakness, difficulty in breathing, dimness of vision, enlargement of the pupils, irregular and intermittent pulse, drowsiness or stupor.

Treatment.—See Method 5 on page 1442.

Darnel.—This is a bearded plant of the grass family, which is found growing with wheat or rye. The seeds are poisonous, and when mixed with the grains mentioned in considerable quantities, and made into flour, frequently, when eaten, give rise to severe giddiness, vomiting, purging, and symptoms of intoxication. Patients, while suffering from its influence, state that all objects appear to be of a uniform green color. Horses and sheep are poisoned by the seeds of this plant, as well as men, though it is stated that pigs, chickens, and some other animals are not affected by it. There is some reason for thinking that the poisonous effects observed from eating seeds of the darnel are due to a diseased condition of the plant, similar to that known as ergot in rye and other grains. A wet season is said to encourage the growth of the darnel with green crops.

No special treatment is required if the cause is recognized and removed.

Lobelia, or Indian Tobacco.—The great use made of this plant by botanic and Thompsonian doctors might lead to the supposition that it is quite harmless. An infusion of a dram of the leaves has been known to produce death. The usual symptoms of poisoning are pain, severe vomiting, very feeble pulse, contraction of the bowels, and unconsciousness. This plant is very closely related to tobacco in its effects. It should never be employed for medicinal purposes.

Treatment.—Encourage vomiting by copious drinking of warm fluids. Strong tea, decoctions of oak-bark, and tannic acid in any form, are especially serviceable. The patient should be kept surrounded with hot bricks or bags filled with hot water. Hot fomentations applied over the heart, and alternate hot and cold applications to the spine are serviceable. Cold applications should be made to the head to relieve cerebral congestion.

Buttercup.—This plant is not a very violent poison, but generally produces severe smarting and burning when taken into the mouth, and if swallowed, occasions inflammation of the stomach. Poisoning by it

should be treated by means of emetics, followed by iced tea and small bits of ice.

Black or Garden Nightshade and Woody Nightshade, or Bitter-Sweet.—Plate XIX. The first-named plants produce red berries, and the second, black ones, which contain the poisonous principle common to the two plants and several others of the same family, known as *solania.* The symptoms of poisoning are great thirst, headache, dimness of vision, dizziness, dilated pupils, convulsions, vomiting, and purging.

Treatment.—Treatment is the same as that recommended for other narcotic poisons. See page 1442, Method 5.

Deadly Nightshade.—This plant is a native of Europe, but has been cultivated in this country, and has in some places become naturalized so that it grows wild. Its roots, leaves, and berries are poisonous, containing the deadly alkaloid known as *atropia.* The symptoms of poisoning are dryness in the mouth and throat, with great thirst which cannot be relieved, nausea, vomiting, and wide dilatation of the pupils, vision indistinct and double, dizziness, palpitation, delirium, and stupor. The symptoms generally appear one to three hours after the poison is taken.

Treatment.—Secure vomiting as soon as possible by an alum or mustard emetic. It is also well to administer a dose of castor-oil. The best antidote is powdered charcoal, animal charcoal being the best. It may be taken in any quantity, from a teaspoonful to two or three tablespoonfuls, without harm. For other treatment see page 1442, Method 5.

Indian Turnip, Dragon-Root, Wake Robin, or Jack in the Pulpit.—Plate XIX. This is a well-known native plant, all parts of which contain an acrid and volatile poison. It produces a severe stinging pain in the mouth when chewed, and sometimes considerable soreness and swelling. Great irritation is produced when any portion is swallowed. The best remedy is milk, which should be drunk freely.

Poke, Scoke, or Garget.—This is a poisonous plant which grows chiefly in uncultivated fields. When matured, the stalks have a purple color, and stand six or eight feet in hight. It produces reddish purple berries, which have a sweetish taste. The root and berries are the most active parts, though the leaves are also poisonous. The chief symptoms of poisoning are severe vomiting, great weakness, tingling of the skin, sometimes stupor. If taken in a large dose, the poison will be expelled by vomiting and diarrhea. If vomiting occurs, plenty of warm water should be taken to encourage it. If it does not, an alum or mustard emetic should be administered, to be followed by doses of powdered charcoal in strong tea. Copious warm enemas are also serviceable.

Garden Nightshade.

Indian Turnip.

PLATE XIX.—*POISONOUS PLANTS.*

Fool's Parsley

Flowers and Root of Aconite, or Wolf's-bane

PLATE XX.—*POISONOUS PLANTS.*

Fool's Parsley.—PLATE XX. This plant closely resembles the poison-hemlock. It may be distinguished from it by the fact that the stem is not spotted. It also closely resembles parsley. It may be usually distinguished by its disgusting odor. If the leaves are eaten, in a short time vomiting, dizziness, severe pain, often numbness, and, in children, convulsions are produced.

Treatment.—Either a mustard or an alum emetic, copious warm drinks, cold to the head, and hot bottles to the limbs. The hot bath, or a blanket pack, may be wisely administered. If the heart becomes weak, fomentations should be applied over the left side of the chest.

Aconite, Wolf's-Bane, or Monk's-Hood.—PLATE XX. This plant is often mistaken for horse-radish, the roots of the two plants being somewhat similar, as may be seen by reference to the plate. They may be easily distinguished, however, by the fact that when the root is cut, it very soon becomes red on exposure, while horse-radish root remains white. The taste is also a means of distinguishing aconite root, which causes a tingling and numbness of the tongue, while horse-radish root has a bitter, pungent, and burning taste. This is a very poisonous plant. The symptoms of poisoning usually come on within a few minutes, and may be described as heat, numbness, and tingling in the head and throat, dizziness, great weakness, pain in the bowels, vomiting, purging, sometimes delirium and stupor, pupils dilated, skin cold, pulse feeble, and breathing depressed. The patient is numb and paralyzed.

Treatment.—Give an emetic at once; then administer powdered charcoal and strong tea or coffee. Apply hot fomentations to the spine, and hot bottles to the limbs. If the breathing ceases, or is very feeble, employ artificial respiration.

Castor-Oil Seeds.—A single seed is sufficient to produce serious symptoms, and three seeds have occasioned death. The symptoms usually appear two or three hours after the seeds have been swallowed. The first symptom is severe pain in the bowels, which is followed by purging and vomiting. In some cases there is hemorrhage from the bowels. The patient becomes cold, and perspiration covers the surface. There is intense thirst, and very small, almost imperceptible, pulse.

Treatment.—Excite vomiting as soon as possible by mustard or alum emetic, and administer strong tea and powdered charcoal, or bone-black.

Potato Balls and Sprouts.—The fruit of the potato familiarly known as potato-balls, contains a poison which has produced fatal effects. Sometimes the leaves and stalks of potatoes are also poisonous. Sprouting potatoes contain the same poison, and it has been found to be present in potatoes which have grown with one side not covered by earth, which

may be known by their green color. The symptoms of poisoning are vomiting, frequent respiration, cold, moist skin, and very feeble pulse. In some cases there is delirium, and the symptoms attending cholera morbus. Potatoes green on one side, and those which are badly sprouted, should never be eaten.

Treatment.—The treatment consists in emetics, hot drinks, hot applications to the extremities, fomentations over the stomach and bowels, and hot and cold applications to the spine.

Sheep-Laurel, Mountain-Laurel, or Big-Leaf Ivy.—PLATE XXI. This plant is said to poison sheep, and was once used by the Indians for making a tea which was taken for the purpose of suicide. Poisoning is sometimes occasioned by eating the flesh of birds which have fed on laurel. The symptoms are nausea, headache, disturbance of vision, coldness of the extremities, and feeble pulse.

Treatment.—A prompt emetic, fomentations to the spine, hot applications about the body, and rubbing with dry flannels or bathing with hot vinegar.

Mushroom Poisoning.—There are some varieties of mushrooms which are sometimes used for food, though not to be recommended for such use; poisoning frequently occurs from eating the poisonous varieties by mistake. Sometimes the harmless species become poisonous from growing in wet places, or from undergoing partial decomposition. The usual symptoms of poisoning are dizziness, disturbance of vision, delirium, and perhaps stupor, pains in the bowels, with violent purging and vomiting.

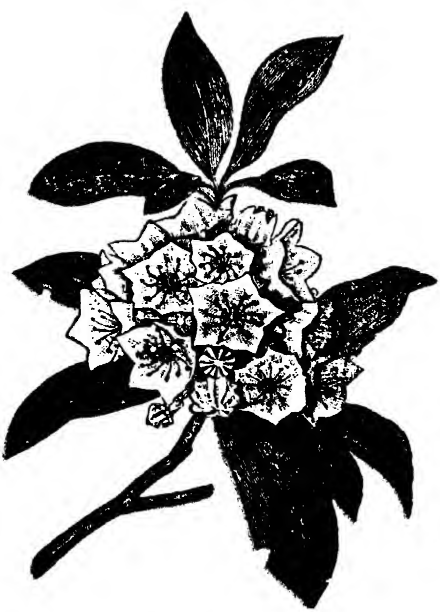
Treatment.—Give an alum or mustard emetic as soon as possible, and follow it by a dose of castor-oil. Keep the extremities warm with hot bricks or bottles or heated sand bags. Make alternate hot and cold applications to the spine, and apply hot fomentations over the stomach and the region of the heart.

Oleander.—This shrub is very commonly cultivated for ornamental purposes, but it is not generally known that every part of it possesses poisonous properties. There is no danger of contamination of the air, however, as the poisonous element is not volatile, and only injures when some portion of the plant is eaten.

Treatment.—The patient should be made to vomit thoroughly and rapidly, and other symptoms should be treated as they may arise.

Henbane.—PLATE XXI. The root of this plant is sometimes mistaken for parsnip. The berries are the most poisonous part, although all parts of the plant are poisonous, containing an alkaloid known as *hyoscyamin*, which is used in medicine. The symptoms are dizziness,

Henbane.



Sheep Laurel.

PLATE XXI.—*POISONOUS PLANTS.*

Yellow Jasmine. (Gelsemium.)

May Apple, or Mandrake. (Podophyllum.)

Plate XXII.—*POISONOUS PLANTS.*

dilatation of the pupils, dimness of vision, delirium, and great prostration. The treatment is the same as for "deadly-nightshade." See method 5, page 1442.

Yellow Jasmine.—Plate XXII. This is a climbing plant, found most abundantly in the South. The flowers and roots are the most poisonous portions. The symptoms are great weakness, dimness of sight, double vision, frequent and feeble pulse. Treatment should be the same as that recommended for other narcotic poisons. Page 1442, Method 5.

Spigelia, Pink Root, or Carolina Pink is used in medicine, particularly as a remedy for round-worms. When taken in poisonous doses, dizziness, dilatation of the pupils, convulsions, and stupor are produced. Treatment according to Method 5, page 1442.

Virginia Creeper, or American Ivy.—This plant has not been generally considered poisonous, but cases have been reported in which poisonous symptoms have been produced by chewing the leaves, the symptoms occasioned being vomiting and purging, dilatation of the pupils, and very great weakness. An emetic should be given. After the stomach has been thoroughly emptied, the patient should be allowed to drink milk or hot tea, and hot applications should be made to the extremities, with fomentations to the spine and over the stomach and heart.

Yew.—This is a low bush, bearing red berries, which, with the leaves, are poisonous. It is said that sheep are not affected by it. Cases of poisoning by it should be treated as directed for laurel poisoning.

May-Apple, or Mandrake.—Plate XXII. This plant is so very common that it need not be described. The fruit is harmless, but the roots and leaves are poisonous, producing violent purging, sometimes attended by hemorrhage from the bowels. Its use in medicine is a purgative.

Treatment.—Rub the patient, give copious hot drinks, administer a hot enema, apply hot fomentations over the stomach and bowels. It is said that the griping is relieved by drinking buttermilk. If a dose has been recently taken, an emetic should be employed.

Water-Hemlock, or Spotted Cow-Bane.—The root resembles that of parsley. The stem has purplish streaks. It usually grows in wet places, and is a very poisonous plant. The symptoms are dizziness, congestion of the face, dilatation of the pupils, and vomiting. Treatment same as for poison-hemlock.

Pulsatilla, or Field Anemone.—The leaves and flowers are poisonous, producing, when eaten, nausea, vomiting, diarrhea, increased action of the kidneys, dimness of vision, and profuse sweating.

Treatment.—Emetics, followed by strong tea and charcoal.

Great African Wonder.

Alcohol,	4	pints.
Oil Sassafras,	3½	ounces.
Oil Origanum,	3½	ounces.
Spts. Camphor,	3½	ounces.
Tinct. Opium,	2	ounces.
Chloroform,	2	ounces.
Turpentine,	2	ounces.
Vinegar,	2	ounces.

Arnica Liniment.

Tinct. Arnica,	8	ounces.
Oil of Sassafras,	½	ounce.
Oil of Turpentine,	½	ounce.
Oil of Origanum,	2	drachms.

Alcohol, Q. S. for 1 pint.

Pain Relief Liniment.

Oil Cajeput,	2	drachms.
Oil Sassafras,	½	ounce.
Oil Origanum,	1	drachm.
Oil Hemlock,	1	drachm.
Oil Cedar,	1	drachm.
Powdered Capsicum,	30	grains.

Alcohol, Q. S. for 1 pint.

Nerve and Bone Liniment.

Oil Origanum, Oil Rosemary, Oil Amber, Oil Hemlock,	of each,	4 ounces.
Turpentine,		4 pints.
Oil Linseed,		6 pints.

Cook's Electro-Magnetic Liniment.

Alcohol,	1 gallon.
Oil Amber,	8 ounces.
Gum Camphor,	8 ounces.
Castile Soap (fine),	2 ounces.
Beef's Gall,	4 ounces.
Aqua Ammonia,	12 ounces.

St. Jacob's Oil.

Gum Camphor,	1	ounce.
Chloral Hydrate,	1	ounce.
Chloroform,	1	ounce.
Sulph. Ether,	1	ounce.
Tinct. Opium,	½	ounce.
Oil Origanum,	½	ounce.
Oil Sassafras,	½	ounce.
Alcohol,	½	gallon.

Hamlin's Wizard Oil.

Tinct. Camphor,	1	ounce.
Aqua Ammonia,	½	ounce.
Oil Sassafras,	½	ounce.
Oil Cloves,	1	drachm.
Chloroform,	2	drachms.
Turpentine,	1	drachm.
Alcohol,	3½	ounces.

California Liniment.

Tinct. Myrrh,	1	ounce.
Tinct. Capsicum,	1	ounce.
Sweet Spts. Nitre,	1	ounce.
Sulph. Ether,	1	ounce.
Chloroform,	½	ounce.
Tinct. Arnica,	1	ounce.
Oil Spearmint,	2	drachms.
Oil Winter-green,	2	drachms.
Oil Lobelia,	1	drachm.
Aqua Ammonia,	½	ounce.
Alcohol,	1	quart.

Favorite Liniment.

Black Oil,	2 ounces.
Alcohol,	3 ounces.
Tinct. Arnica,	2 ounces.
British Oil,	2 ounces.
Oil of Tar,	1 ounce.

Black Oil Liniment.

Sulph. Acid,	2	ounces.
Nitric Acid,	1	ounce.
Quicksilver,	½	ounce.

Opodeldoc Liniment.

Alcohol,	1	quart.
Gum Camphor,	1	ounce.
Sal. Ammoniac,	¼	ounce.
Oil of Wormwood,	½	ounce.
Oil Origanum,	½	ounce.
Oil Rosemary,	½	ounce.
Soft Soap,	6	ounces.

Pride of India Liniment.

Oil Lini,	½	gallon.
Gum Camphor,	4	ounces.
Oil Sassafras,	2	ounces.
Spts. Nitre,	2	ounces.
Alcohol,	1	pint.

Oil of Spike.

Petroleum Barbadoes,	4 ounces.
Spts. Turpentine,	4 ounces.
Oil Linseed,	1 pint.
Oil Seneca,	4 ounces.

Perry Davis's Pain Killer.

Spts. Camphor,	2	ounces.
Tinct. Capsicum,	1	ounce.
Tinct. Guaiac,	½	ounce.
Tinct. Myrrh,	½	ounce.
Alcohol,	4	ounces.

Great London Liniment.

Chloroform,
Olive Oil,
Aqua Ammonia,
Acetate of Morphia.

OINTMENTS.

Trask's Magnetic Ointment.

Lard,	each, equal parts.
Raisins,	
Fine Cut Tobacco,	

Seeley's Pile Ointment.

Sulph. Morphia,	8 grains.
Tannin,	48 grains.
Pine Tar,	72 grains.
White Wax,	72 grains.
Benzoated Lard,	766 grains.

Black Salve.

Olive Oil,	32	ounces.
Resin (clear),	1	ounce.
Beeswax,	1	ounce.
Venice Turpentine,	½	ounce.
Red Lead,	6	ounces.
Gum Camphor (powdered),	½	ounce.

Petit's Eye Salve.

White Precipitate,	1½	ounces.
Oxide Zinc,	2	ounces.
Benzoic Acid,	1	drachm.
Sulph. Morphia,	24	grains.
Oil Rosemary,	10	drops.
Oil Olive,	16	ounces.
Spermaceti,	6	ounces.
White Wax,	2	ounces.

Ointment of Iodoform.

Iodoform,	1 drachm.
Balsam Peru,	1 drachm.
Vaseline,	1 ounce.

Sanative Ointment.

Mutton Suet,	16	ounces.
Oil of Sesame,	5	ounces.
Oil of Origanum,	1	ounce.
Camphor,	2	ounces.
Resin,	2	ounces.
Yellow Wax,	2	ounces.
Borax, Powd.,	⅛	ounce.
Glycerine,	¼	ounce.

Green Mountain Salve.

Resin,		5	pounds.
Burgundy Pitch,	of each,	¼	pound.
Beeswax,			
Mutton Tallow,			
Oil of Hemlock,	of each,	1	ounce.
Balsam Fir,			
Oil Origanum,			
Oil Red Cedar,			
Venice Turpentine,			
Oil Wormwood,		½	ounce.
Verdigris (pulverized),		1	ounce.

Compound Oxygen.—Probably one of the most successful of recent fraudulent nostrums is that known as "Compound Oxygen." We have so often met persons who had spent large sums of money for this worthless stuff without being in the slightest degree benefited; that we have felt it to be a duty we owe our fellow-men to investigate the matter thoroughly, and publish the results. We accordingly obtained fresh samples of "Compound Oxygen" and "Oxygen Aquæ" which had just been received from the manufacturers in Philadelphia, and sent them for analysis to Prof. A. B. Prescott, M. D., professor of chemistry in the University of Michigan, which possesses one of the largest and most complete chemical laboratories in the country and probably in the world. After subjecting the compound oxygen, so-called, to a careful analysis, Prof. Prescott reported to us as follows :—

"A solution of nitrate of ammonium and nitrate of lead in water, in not far from equal proportions, and together forming just three per cent of the liquid."

It should be recollected that this solution is to be used by inhalation, a teaspoonful being added to a small quantity of warm water through which air is drawn by means of a glass tube. Neither of the substances contained in the solution are volatile at the temperature at which the solution is used, so that it is impossible for any medicinal property

whatever to be imparted by this boasted remedy, except what comes from the warm water, which is itself very healing when used in this way, as we have demonstrated in hundreds of cases. Prof. Prescott also tested the vapor given off from the pure solution when it was boiled, but found nothing more than the vapor of water.

The "Compound Oxygen" is usually accompanied by what the manufacturers are pleased to call "Oxygen Aquæ," which they recommend their patients to take as an aid to digestion. The analysis of this showed it to contain nothing but water. The most careful tests revealed nothing else.

The following description of a number of popular nostrums we quote, with the authorities, from *The Popular Health Almanac* for 1876 and 1877; as will be seen, many of them are dangerous and unfit for the purposes for which they are recommended:—

Mrs. Winslow's Soothing Syrup comes in vials containig 1¾ fluid ounces; it consists of sugar syrup strongly flavored with an alcoholic tincture of fennel — anise — and a little caraway-seed, or an alcoholic solution of their essential oils, and with or without an admixture of solution of sulphate of morphine in various quantities. While recently it has been found not always to contain morphine, at times as much as one-half of a grain and more has been found contained in each fluid ounce of the syrup, as often reported in the course of years in medical and pharmaceutical journals. In regard to the dangers of this nostrum, which conceals morphine under a legitimate designation, and offers it for administration to infants, a medical writer in the *Pacific Medical and Surgical Journal*, April 18, 1872, remarks: "It would be scarcely possible to estimate the number of children which it sends to the grave before they reach their second year. Another still graver question is: How much of the physical disease, drunkenness, degradation, and vice, and how many of the weakened intellects, are due to the use of the soothing syrup in infancy?"

John Hill's Pectoral Balsam of Honey.—Each bottle holds 1¼ fluid ounces of a brown liquid consisting of a tincture of 9 parts by weight of balsam Tolu, 2 parts of prepared balsam of storax, and 1 part of opium in 300 fluid parts of strong alcohol, sweetened with 80 parts of clarified honey.—*Hager.*

Dalby's Carminative.— Each bottle contains 1½ fluid ounces of a whitish turbid liquid consisting of ¼ fluid ounce of strong alcohol, 1 drop oil of anise-seed, 10 drops of tincture of asafetida, a few drops of compound tincture of cardamom, and 10 drops of tincture of opium; which mixture, when prepared, is added to a solution of 10 grains of bicarbonate of potash and ½ ounce of sugar in 1 fluid ounce of peppermint water, or instead of the latter, in 1 fluid ounce of water intimately mixed with 1 or 2 grains of carbonate of magnesia and one drop of oil of peppermint.— *Hoffmann.*

Walker's California Vegetable Vinegar Bitters.—Each bottle contains 19 to 20 fluid ounces consisting of a decoction of aloes and a small quantity of gum guaiac, anise-seed, and sassafras bark, in water slightly acidulated with acetic acid, or by subsequent fermentation, or by the use or addition of sour cider; to this are added about 1 ounce of sulphate of soda, ¼ ounce of gum arabic, and ½ to 1 fluid ounce of alcohol.— *Eberbach. Hoffmann. Nichols.*

"This 'Bitters' is one of the nastiest nostrums, introduced and largely sold by the most extensive and brazen advertising under the false pretense of being free from alcohol. It originated with the cook of a party which traveled overland as a mining company to California in 1849; he settled in Calaveras county, and having no success as a miner, he turned his attention to the bitter qualities of the herbs growing about him, and came to San Francisco with the idea of making and vending a nostrum to be called 'Indian Vegetable Bitters.' He fell in with an enterprising druggist, who saw money in the project, and joined him. At the suggestion of the latter, the 'Indian' was struck out, and as the concoction got sour by fermentation, it was concluded to call it 'Vinegar Bitters,' and to iden-

tify it with the temperance movement. The native herbs which became rather troublesome to collect, were discarded, and aloes, being a cheap bitter, was substituted. 'Nine sick people out of ten,' said the druggist, 'will be cured by purging.' Wherefore the aloes and Glauber's-salt. So the cook turned doctor, the decoction became sour and of Californian instead of Indian paternity, and 'Doctor Walker's Vinegar Bitters' began their career in the newspapers and on the shelves of the drug-stores." (From Dr. Gibbon's address before the annual meeting of the California State Medical Society. *Pacific Medical and Surgical Journal*, 1874; and "Third Annual Report of the Board of Health of the City of Boston," 1875.)

[At the present time this wretched preparation is said to be made of sour beer and aloes. A specimen which we examined some years ago we found to contain 5 per cent of alcohol.]

Brandreth's Pills.—Each box contains 24 or 25 pills, each weighing about 2½ grains. The 24 pills consist of 10 grains of the root of May-apple, 10 grains of the extract of the same, 30 grains of the extract of poke-berries, 10 grains of powdered cloves, 2 to 5 grains of gamboge, traces of Spanish saffron, and a few drops of oil of peppermint.—*Hager.*

Ayer's Cathartic Pills.—Each box contains 30 sugar-coated pills, each weighing nearly 4 grains, and consisting of aloes, compound extract of colocynth, gamboge, Spanish pepper, and oil of peppermint.—*Hager. Hoffmann.*

Radway's Ready Relief.—2½ fluid ounces (in a 50 ct. bottle) of a light brown liquid consisting of 2 ounces of soap liniment, 2 drachms alcoholic tincture of Spanish pepper, and 2 drachms of strong aqua ammonia (hartshorn).—*Hager. Peckolk. Hoffmann.*

Radway's Renovating Resolvant.—About 6 fluid ounces of a vinous tincture of cardamom and ginger sweetened with sugar.—*Hager.*

Pierce's Golden Medical Discovery.—7 fluid ounces of a dark brown liquid consisting of a solution of 1 drachm extract of lettuce, 1 ounce of honey, ½ drachm tincture of opium in 3 ounces of dilute alcohol, and 3 ounces of water.—*Hager.*

Pierce's Favorite Prescription.—10 fluid ounces of a greenish-brown turbid liquid consisting of a solution of ½ ounce of sugar and 1 drachm of gum arabic in 8 ounces of a decoction made from 2 drachms of savine, 2 drachms of white agaric, 1¼ drachms of cinnamon, and 2 drachms of cinchona bark; to this mixture are added ½ drachm of tincture of opium, and ½ drachm of tincture of fox-glove, and a solution of 8 drops of oil of anise-seed in 1½ ounces of alcohol.—*Hager.*

Sage's Catarrh Remedy.—Half an ounce of a green powder consisting of 200 grains of finely powdered common salt mixed with 8 to 12 grains of powdered camphor, the same quantity of carbolic acid, and colored with a mixture of 20 grains finely powdered yellow Puccoon root with 2 grains of indigo.—*Bowen.*

Hamburg Tea.—Each package, weighing about 2 ounces, consists of 1 ounce of senna leaves, ½ ounce of manna, ¼ ounce of bruised coriander fruit, and ⅛ ounce of powdered cream tartar, or tartaric acid.—*Hager.*

Van Buskirk's Fragrant Sozodont.—Each vial contains nearly 2 fluid ounces of a red liquid consisting of a filtered solution of ½ drachm white Castile soap in 1 ounce of strong alcohol, ¾ ounce of water, and ¼ ounce of glycerine, colored with cochineal and flavored with the oils of peppermint, cloves, and winter-green.

The powder which accompanies each bottle consists of a mixture of precipitated chalk, powdered orris-root, and carbonate of magnesia.—*Wittstein. Hoffmann.*

Tarrant's Effervescent Seltzer Aperient consists of a mixture of powdered sugar, Epson salt, bicarbonates of soda and potash, and tartaric acid.—*W. Schrage. 1875.*

Billing and Clapp's Cincho-Quinine is an arbitrary mixture of the four principal cinchona alkaloids; its therapeutical value is fully represented by mixing 94 parts of sulphate of cinchonine with about 2 parts each of sulphates of quinine, quinidine, and cinchonidine. This nostrum, therefore, is *not* an alkaloidal representation of cinchona bark.—*Ebert. 1874. Scheffer. Diehl. 1875.*

R. V. Pierce's Pleasant Purgative Pellets.—Each little bottle contains 28 to 36 small sugar-coated pills of unequal size, and weighing in all 18 to 22 grains. Their cathartic effect is solely due to podophyllin, the resin of the root of the May-apple.—*Lyons. Hoffmann. Polenske. 1876.*

Ayer's Ague Cure.—Each bottle contains six ounces of a dark red syrupy liquid, with a slight white sediment, a very bitter taste, and an odor of winter-green oil. It consists of an alcoholic tincture of cinchona bark, with the addition of about three grains of quinoidine and three grains of sulphate of cinchonine for each fluid ounce, dissolved by the aid of sulphuric acid; it is sweetened with sugar and flavored with oil of winter-green. The white sediment consists of sulphate of lime.—*O. L. Churchill. 1876.*

Jayne's Ague Mixture.—Each bottle contains 7½ fluid ounces of a mixture having the odor and taste of rhubarb, dandelion, and common molasses. It contains sulphate of quinine and traces of other cinchona alkaloids, but not enough to render the mixture very bitter.—*O. L. Churchill. 1876.*

Rhode's Fever and Ague Cure, or Antidote to Malaria.—Each bottle contains 12 fluid ounces of a black turbid liquid, having a sweet and astringent taste. The sediment, filling about one-third of the bottle after standing, is powdered animal charcoal, while the solution is nothing but sweetened water with a little tincture of chloride of iron, with the addition of a little sulphate of iron (copperas).—*O. L. Churchill. 1876.*

Wilhoft's Antiperiodic Fever and Ague Cure.—Each bottle contains four fluid ounces of a thin, dark-red liquid, with the odor of cinchona bark, and a very bitter and acid taste. It consists of an infusion of cinchona bark made with water, and the addition of a solution of sulphate of quinine in aromatic sulphuric acid. Each fluid ounce contains 8 grains of sulphate of quinine.—*O. L. Churchill. 1876.*

Christie's Ague Mixture.—Each bottle contains 7 fluid ounces of a very dark, syrupy liquid, one-fourth filled with sediment, and having a very bitter and peppery taste and the odor of common molasses. The sediment is powdered Spanish pepper and a little resinous matter. The solution consists of a tincture of cinchona bark with the addition of sulphate of cinchonine and common molasses.—*O. L. Churchill. 1876.*

D. C. Frese and Co.'s Imported (?) Hamburg Tea consists of a mixture of broken senna leaves and remnants (leaf-stalks, stones, dust, etc.) from fanning and sifting partially inferior grades of commercial senna, coarsely powdered coriander fruits, and manna intimately mixed with tartaric acid. The quantities of these ingredients in each package are, approximately: leaves, stalks, and dust of senna, together 10 drachms, coriander fruits 1½ drachms, manna 1½ drachms, tartaric acid 8 to 12 grains.—*Hoffmann. 1876.*

Radway's Regulating Pills.—Each box contains 29 to 31 sugar-coated pills of unequal size. They consist of 30 grains of aloes, 15 grains of jalap, 8 grains of gamboge, and of some inert substance.—*Hager. 1876.*

Morison's Pills.—Each pill weighs 2½ grains; they consist of equal parts of aloes, colocynth, and cream-of-tartar; those in boxes marked No. 2 contain, besides these ingredients, gamboge.—*L. Buchner.*

Dehaut's Purgative Pills (French) consist of scammony resin, powdered rhubarb-root, and the extracts of colocynth and dandelion root. They are coated with red-colored sugar. —*Hager. Jacobsen.*

Blancard's Pills (*Pilules de Blancard*, Paris) consist of iodide of iron, honey, and the powders of liquorice roots and marsh mallow roots. They are covered with powdered iron, and coated with balsam of Tolu. Each pill contains about ½ grain of iodide of iron.—*Landerer.*

Franc's Life Pills (*Grains de santé* or *Grains de vie* du docteur FRANK).—Each box contains about 50 two-grain pills, covered with silver-foil, and consisting of four parts, by weight, of aloes, and one part of gamboge.—*Wittstein.*

Papier Fayard-Blayn.—A French Paper for Rheumatism, etc., consists of nothing but a strip of strong silk paper, 16 by 10½ inches, saturated with overheated, dark brown lead plaster.—*Hager.*

John F. Henry's Carbolic Healing Salve.—Each tin can cantains about half an ounce of a whitish ointment, consisting of about half an ounce of simple cerate, five grains of carbolic acid, and 2 drops each of oil of bergamot and lavender.—*Hager. Jacobsen.*

Rourke's Iodine Liniment and **Wm. Gile's Liniment of Iodide of Ammonia**—the latter being an imitation or rather a new edition of the former—consist of a solution of 15 grains of iodine, 2 drachms of camphor, and 1 drachm each of the oils of lavender and rosemary, in half a pint of alcohol and 1 ounce of strong hartshorn (ammonia water).—*Druggist's Circular. 1875.*

Tobias's Venetian Liniment.—Each bottle contains a little less than two fluid ounces of a light-brown liniment, consisting of a mixture of one ounce of spirits of camphor, ½ ounce of weak ammonia water, and 1½ drachms of tincture of Spanish pepper.—*Schaedler.*

Medicated Pads.—The sale of the various sorts of liver, lung, stomach, and other kinds of pads has been one of the most successful of the numerous frauds perpetrated upon the gullible portion of the people. Carloads of these worthless remedies have been sold in some States for "absorbing malaria out of the system." It is scarcely conceivable that any appreciable medicinal benefit is produced by the wearing of these precious bags, and we should not by any means wish to have our reference to them here construed to mean anything like approval of their use. The following are a few of the most popular:—

Anti-Constipation Pad.

Mandrake Root,
Aloes (powd.),
Ex. Colocynth Comp. (powd.),
Croton Oil,
Oil Sassafras,
Black Root,
Lady's-Slipper.

Day's Kidney Pad.

Black Cohosh,
Gum Benzoin (powd.),
Gum Guaiacum (powd.),
Juniper Berries,
Queen of the Meadow,
Digitalis Leaves,
Oil Juniper.

French Uterine Pad.

Blue Cohosh,
Gum Guaiac (powder),
Witch-Hazel Bark,
Ergot,
Cinchona Bark,
Angelica Root,
Oil Tansy,
Oil Stillingia,
Oil Lobelia,
Oil Lavender,
Oil Eucalyptus.

Stomach Pad.

Bayberry,
Lupuline,
Wild Ginger,
Sassafras Bark,
Gum Myrrh,
Lady's-Slipper,
Capsicum,
Oil Fennel,
Oil Cloves.

Lung Pad.

Grindelia Robusta,
Scull Cap Leaves,
Blueberry Root,
Blood Root,
Yerba Santa,
Gum Ammoniac,
White Pine Turpentine Gum,
Oil of Tar,
Oil of Eucalyptus,
Oil of Sassafras.

Head Pad.

Lupuline,
Lady's-Slipper,
Battle's Bromidia,
Fluid Ext. Jamaica Dogwood,
Angelica Root,
Oil Eucalyptus.

Liver Pad.

Mandrake Root,
Bayberry Bark,
Black Root,
Red Cinchona Bark,
Gum Guaiac (powder),
Fenugreek Seed (powder),
Oil Eucalyptus.

Catarrh and Croup Pad.

Lobelia (herb),
Tartar Emetic,
Blood Root,
Blue Cohosh,
Yellow Peruvian Bark,
Pleurisy Root,
Gum Myrrh,
Oil Stillingia,
Oil Cajeput,
Oil Cinnamon,
Oil Lavender.

Artificial Essences and Extracts.—It is not generally known, as it should be, that nearly all the essences made are wholly innocent of any admixture of the real fruit from which they are named. The following is believed to be a correct representation of the composition of some of the essences most commonly used with soda-water, etc.:—

Essence of Quince.

Pelargonic Ether,
Alcohol, 95 per cent,
Water,
Color yellow.

Essence of Apple.

Acetate of Oxide Amyl,
Valerianate of Ammonia,
Cologne Spirits,
Water.

Essence of Banana.

Acetate of Oxide Amyl,
Alcohol,
Water.

Peach Extract.

Alcohol,
Concentrated Nectarine Ether,
Concentrated Pine-Apple Ether,
Oil of Orange (Portugal),
Warm Water,
Glycerine.

Pine-Apple Extract.

Butyric Ether,
Ext. Lemon,
Tinct. Orange Peel (sweet),
Alcohol,
Color lightly with Caramel.

Essence of Pear.

Acetate Oxide of Amyl,
Acetic Ether,
Alcohol, 95 per cent,
Water.

Sarsaparilla Extract.

Alcohol,
Oil of Sassafras,
Oil of Winter-green,
Warm Water.

Extract of Vanilla.

Balsam Peru,
Oil Orange,
Extract Orris,
Tonka Beans (coarse powder),
Tinct. Castor,
Cologne Spirits,
Carb. Magnesia,
Water.

Extract of Apricot.

Glycerine,
Chloroform,
Butyrate of Ethyl,
Valerianate Ethyl,
Œnanthylate Ethyl,
Salicylate of Methyl,
Butyrate of Amyl,
Alcohol,
Color lightly with Caramel.

Mineral Waters.—Most people, in drinking mineral waters, imagine that they are imbibing a fluid which in the hidden recesses of the earth has acquired some mysterious curative properties, connected with its unpleasant flavor, never once suspecting that in all probability the water was taken from some well or river in their own town, rather than from the distant or foreign spring, to which has been added a few chemicals, the nature of which the chemist has discovered by careful analyses of the various natural mineral waters. We do not wish to intimate that the artificial mineral waters are not equally as good as the original. Since they contain all the active ingredients of those which they imitate, we can see no reason why they may not be equally as good as the original, and, indeed, in some instances they may be even better; but we have very little to say in commendation of either one. The following are the formulæ said to be used by the manufacturers of mineral waters:—

Hunyadi Janos Water.

Sulphate of Lime,	1½	ounces.
Glauber's Salts,	24	ounces.
Epsom Salts,	26	ounces.
Sulphate of Potassa,	1	drachm.
Water,	10	gallons.

Seltzer Water.

Bi-Carbonate of Soda,	5½	ounces.
Carbonate of Magnesia,	7	drachms.
Marble Dust,	½	ounce.
Muriatic Acid (C. P.),	5¾	ounces.
Water,	10	gallons.

Kissingen Water.

Bi-Carbonate of Soda,	1 drachm.
Carbonate of Lime,	2 drachms+2 scru.
Precipitate Carb. Iron,	2 scruples.
Phosphate Lime,	2 drachms+2 scru.
Phosphate Soda,	13 grains.
Sulphate Magnesia,	2 ounces.
Sulphate Soda,	2 drachms+2 scru.
Muriate Ammonia,	4 grains.
Common Salt,	8 ounces.

Vichy Water.

Carbonate of Ammonia,	10	grains.
Bi-Carbonate of Soda,	5¼	ounces.
Common Salt,	6	drachms.
Phosphate of Soda,	25	grains.
Sulphate of Soda,	4	scruples.
Sulphate of Potassa,	2	drachms.

Carlsbad Water.

Sulphate of Soda,	100 grains.
Carbonate of Soda,	25 grains.
Sulphate of Magnesia,	15 grains.
Chloride of Sodium,	16 grains.
Chloride of Calcium,	15 grains.
Tartrate of Iron and Potassa,	10 grains.
Water,	10 gallons.

Congress Water.

Calcined Magnesia,	1	ounce.
Bi-Carbonate Soda,	20	grains.
Hydrate of Soda,	23	grains.
Common Salt,	7¾	ounces.

Artificial Wines, Whiskies, Bitters, etc.—Those who make use of these unwholesome substances, possess little knowledge of their constituents. Nearly all are very largely adulterated in the case of wines and liquors, and the bitters are rarely composed of anything which will be at all likely to do a person any real good.

To Neutralize Whisky.

Whisky,
Unslacked Lime,
Alum (powdered),
Spirits of Nitre.

Irish or Scotch Whisky.

Proof or Neutral Spirits,
Creosote, dissolved in 1 pint of Alcohol,
Acetic Acid,
Loaf Sugar.

Old Bourbon Whisky.

Proof Spirits,
Good Bourbon Whisky,
Spirits of Nitre,
Fusel-Oil (from Corn), cut in 1 qt. Alcohol.

Rochelle, or Bordeaux Whisky.

Proof Spirits,
Oil Cognac,
White Sugar,
Œnanthic Ether,
Acetic Ether,
Tinct. Kino.

Peach Brandy.

Proof or Neutral Spirits,	40 gallons.
Peach Brandy (pure),	3 gallons.
Bitter Almonds (crushed),	1 pound.
Loaf Sugar, Powd.,	4 pounds.

Brandy.

Neutral, or Pure Spirits,	40 gallons.
Crude Tartar dissolved in Hot Water,	10 ounces.
Jamaica Rum,	2 gallons.
Raisins (bruised),	4 pounds.
Tinct. Kino,	3 ounces.

Color with Sugar Coloring.

Holland Gin.

Proof or Neutral Spirits,	40 gallons.
Spirits of Nitre,	2 ounces.
Loaf Sugar,	4 pounds.
Oil Juniper,	1 oz., } cut in Alcohol 1 qt.
Oil Caraway,	⅛ oz., }

Gin.

Pure Spirits,	40 gallons.
Best Gin,	5 gallons.
Juniper Berries,	2 pounds.
Sweet Fennel Seed,	½ ounce.
Spirits Nitre,	2 ounces.
Loaf Sugar,	1 pound.
Alcohol,	½ gallon.

Prepared Cider.

Pure Cider, Sweet,	40 gallons.
Pure Spirits,	3 gallons.
Sugar or Syrup,	3 pounds.
Crude Tartar,	½ pound.

Madeira Wine.

Prepared Cider,	40	gallons.
Tartaric Acid,	½	pound.
Alcohol,	4	gallons.
Loaf Sugar,	3	pounds.

Malaga Wine.

Prepared Cider,	40	gallons.
Water,	5	gallons.
N. O. Sugar,	16	pounds.
Alcohol,	4	gallons.

Sherry Wine.

Prepared Cider,	40	gallons.
Essence Bitter Almonds,	½	pint.
Loaf Sugar,	4	pounds.
Cheap Cape Wine,	8	gallons.
Tinct. Kino,	2	ounces.

Claret Wine.

Prepared Cider,	40	gallons.
Water,	5	gallons.
The Juice of	40	lemons.
Sugar,	2	pounds
Cream of Tartar,	4	ounces.
Pure Spirits,	3	gallons

Port Wine.

Prepared Cider,	40	gallons.
Proof Spirits,	5	gallons.
Wild Grapes,	10	quarts.
Rhatany Bark (bruised),	1	pound.
Loaf Sugar,	3	pounds.
Tinct. Kino,	4	ounces.

Stoughton Bitters.

Orange Peel,	(ground)	6	ounces.
Gentian Root,	"	8	ounces.
Virginia Snake Root,	"	1½	ounces.
American Saffron,	"	½	ounce.
Red Saunders,	"	½	ounce.
Alcohol,		4	pints.
Water,		4	pints.

German Bitters.

German Camomile,	2	ounces.
Sweet Flag,	2	ounces.
Orris Root,	4	ounces.
Coriander Seed,	1½	ounces.
Centaury,	1	ounce.
Orange Peel,	3	ounces.
Alcohol,	4	pints.
Water,	4	pints.
Sugar,	4	ounces.

Stomach Bitters.

Gentian Root,	(ground)	1½	ounces.
Cinchona Bark,	"	½	ounce.
Orange Peel,	"	2½	ounces.
Cinnamon Cort.,	"	¼	ounce.
Anise Seed,	"	½	ounce.
Coriander Seed,	"	½	ounce.
Cardamom Seed,	"	⅛	ounce.
Gum Kino,		¼	ounce.
Alcohol,		1	pint.
Water,		4	quarts.
Sugar,		1	pound.

French Absinthe.

Oil Wormwood,	1	drachm.
Oil Melisa,	15	drops.
Oil Anise,	2½	drachms.
Oil Star Anise,	2½	drachms.
Oil Fennel,	½	drachm.
Oil Coriander,	3	drops.
Alcohol,	14	pints.
Water,	6	pints.

Hop Bitters.

Hops,	4	ounces.
Orange Peel,	2	ounces.
Cardamom,	2	drachms.
Cinnamon,	1	drachm.
Cloves,	½	drachm.
Alcohol,	8	ounces.
Sherry Wine,	2	pints.
Simple Syrup,	1	pint.
Water, sufficient.		

MISCELLANEOUS.

Godfrey's Cordial.

Tinct. Opium,
Molasses,
Alcohol,
Water,
Carb. Potassa,
Oil Sassafras.

Mother's Cordial.

Partridge-berry (herb),
Helonias,
Blue Cohosh,
High Cranberry (bark),
Water,
Brandy,
Sugar.

Elixir of Life.

Powdered Rhubarb,
Powdered Ginger,
Powdered Aloes,
Powdered Gum Myrrh,
Powdered Cayenne,
Powdered Saffron,
Powdered Sassafras Bark,
Powdered Golden Seal Root,
Brandy or Whisky.

Tropic Fruit Laxative.

Powd. Senna Leaves,
Powd. Anise Seed,
Tamarinds (pulp),
Molasses.

Incense Powder.

Ground Gum Benzoin,	¼	pound.
Ground Cascarilla Bark,	¼	pound.
Ground Sandal-wood,	⅛	pound.
Powdered Nitrate of Potassa,	1	ounce.
Grain Musk,	10	grains.

English Curry Powder.

Powdered Coriander Seed,
Powdered Allspice,
Powdered Mace,
Powdered Caraway,
Powdered Fennel,
Powdered Celery Seed,
Powdered Turmeric,
Ground Capsicum,
Ground Mustard,
Ground Ginger,
Table Salt.

Butter Color.

Annatto, of good quality,
Caustic Soda, or Potassa,
Borax, powdered,
Tincture of Turmeric,
Water.

Haarlem Oil.

Balsam of Sulphur,
Barbadoes Tar,
Crude Oil of Amber,
Oil of Turpentine,
Linseed Oil.

Smith's Electric Oil.

Linseed Oil,
Olive Oil,
Sassafras Oil,
Chloroform.

Trix, or Jokes.

Powd. Extract Liquorice,
Oil of Cloves,
Oil of Cinnamon.

Brown's Bronchial Troches.

Pulv. White Sugar,
Pulv. Extract of Liquorice,
Pulv. Cubebs,
Pulv. Acacia,
Fluid Extract Conium.

Chlorodyne.

Purified Chloroform,
Stronger Ether,
Stronger Alcohol,
Molasses,
Powdered Ext. Liquorice,
Muriate of Morphia,
Oil of Peppermint,
Simple Syrup,
Hydrocyanic Acid.

Jayne's Expectorant.

Syrup Squills,
Tinct. Tolu,
Tinct. Camphor,
Tinct. Lobelia,
Tinct. Digitalis,
Tinct. Opium,
Wine Ipecac,
Antimon. Tart.

Coe's Dyspepsia Cure.

Fluid Extract Yellow Root,
Fluid Extract Wild Cherry,
Bi-Carbonate Soda,
Essence Peppermint,
Simple Syrup.

August Flower.

Rhubarb,
Golden Seal,
Cape Aloes,
Peppermint Leaves,
Carbonate of Potassa,
Capsicum,
Sugar,
Alcohol,
Water,
Ess. Peppermint.

Piso's Consumption Cure.

Tincture of Tolu,
Fluid Extract Lobelia.
Fluid Ext. of Cannabis Indica,
Sulphate of Morphia
Tartar Emetic,
Chloroform,
Ess. Spearmint,
Hot Water,
Sugar.

Bromidia.

Bromide of Potassa,
Chloral Hydrate,
Solid Extract Hyoscyamus,
Solid Ext. Cannabis Indica,
Alcohol,
Soft Water.

German Syrup.

Oil of Tar,
Fluid Extract Ipecac,
Tincture of Opium,
Fluid Extract Wild Cherry,
Water,
Sugar,
Carbonate of Magnesia.

Consumption Cure.

Syrup Tolu,
Syrup Wild Cherry,
Tinct. Hyoscyamus,
Syrup Squills,
Chloric Ether,
Water.

Corn Cure.

Tannin, 30 grains.
Tinct. Iodine, Acetic Acid, Glycerine, } each, 1 drachm.

Jackson's Cough Syrup.

Syrup of Acacia,
Syrup of Ipecac,
Syrup of Senega,
Oil Sassafras,
Sulphate Morphia.

Osgood's Cholagogue, or Celebrated Ague Cure.

Sulph. Quinine,
Fluid Ext. Leptandrin,
Saturated Tinct. of Queen's Root,
Fluid Ext. Podophyllin,
Oil Sassafras,
Oil Winter-green.

Thompson's Eye Water.

Sulphate of Copper,	10 grains.
Sulphate of Zinc,	40 grains.
Rose-Water,	2 pints.
Tinct. Saffron,	4 drachms.
Tinct. Camphor,	4 drachms.

Allen's Lung Balsam.

Tinct. Sanguinaria,
Tinct. Lobelia,
Tinct. Opium,
Tinct. Capsicum,
Essence Sassafras,
Essence Anise,
New Orleans Molasses.

Upham's Pile Ointment.

Powdered Galls,
Powdered Sugar Lead,
Powdered Opium,
Simple Cerate.

Loomis's Tonic.

Sulph. Quinine,
Aqua,
Chloroform,
Tinct. Mur. Iron,
Glycerine.

Tully Powder.

Sulphate Morphia,
Pulverized Camphor,
Pulverized Liquorice Root,
Prepared Chalk.

Upham's Asthma Remedy.

Pulv. Stramonium Leaves,
Pulv. Skunk Cabbage,
Pulv. Lobelia.

Beach's Diaphoretic.

Powd. Opium,
Powd. Ipecac,
Powd. Camphor,
Powd. Cream Tartar.

Safe Kidney and Liver Cure.

Fluid Ext. Buchu,
Fluid Ext. Pareira Brava,
Fluid Ext. Mandrake,
Fluid Ext. Leptandrin,
Spirits Nitre, Dulc.,
Oil Juniper,
Bi-Carb. Potassa,
Syrup Orange Peel.

Worcestershire Sauce.

Cider Vinegar,
Sherry Wine,
Allspice, powdered,
Cloves, powdered,
Black Pepper, powdered,
Ginger, powdered,
Cayenne,
Mustard, powdered,
Salt,
Shallots,
Sugar,
Tamarinds,
Curry Powder.

Bromo-Chloralum.

Alum, coarse powder,	1 pound.
Boiling Water,	2 pints.
Aqua Ammonia, sufficient,	
Muriatic Acid, sufficient,	
Bromine,	½ ounce
Water, sufficient.	

Wistar's Cough Lozenges.

Ext. Liquorice, powdered,
Gum Arabic, powdered,
Sugar, powdered,
Oil Anise,
Sulph. Morphia,
Tinct. Tolu,
Water.

German Rheumatic Remedy.

Wine Colchicum,
Tinct. Opium,
Spirits Nitre, Dulc.

CHOICE PRESCRIPTIONS.

THE following choice prescriptions are such as may be used with the confidence that they will accomplish all that can fairly be expected of medicines. But it must be borne in mind that medicines are seldom curative in their effects; and at best can simply palliate symptoms. Diseases are cured by the correction of bad habits, or the removal of other causes, and by the efforts of Nature, rather than by any mysterious potency of drugs. Care has been taken to avoid such prescriptions as will be likely to be abused, and result in harm. The prescriptions given are selected f. . among those which we have found most useful for the purposes fo. which they are severally recommended.

For Dyspepsia. The various forms of dyspepsia require very different remedies. The proper regulation of the diet is the most important measure of treatment, but the following prescriptions we have found useful as palliatives of various troublesome symptoms, and aids to a more speedy recovery: —

℞.	Bismuth Subcarb.,	dr. 4.	
	Glycerine,	oz. 1.	
	Aquæ,	oz. 2.	M.

Dose.— A teaspoonful before each meal. Useful in cases in which there is great tenderness of the stomach and pain immediately after eating.

℞.	Extract of Hydrastis,	dr. 2.	
	Glycerine,	oz. 1.	
	Aquæ,	oz. 1.	M.

Dose.—A teaspoonful. Use same as the preceding, and in cases of ulcer of the stomach.

℞.	Pure Pepsine,	dr. 1.	
	Sugar of Milk,	dr. 1.	M.

Make into sixteen powders, and take one after each meal. Excellent in cases of flatulent and acid dyspepsia. Such patients should also drink two to four glasses of hot water one hour (not less) before each meal. The pepsine must be pure, concentrated, not the saccharated pepsine usually sold in drug stores.

Peptonized Gruel.—To one pint of sweet milk add ten grains of bi-carbonate of soda (what will lie on a silver ten-cent piece) and five grains of pure pancreatin. Place in a warm place for half an hour. The appearance of a slight bitter flavor is evidence that the digestion has proceeded far enough. Eat at once, or boil to prevent further action. This is a most excellent food in cases requiring artificial aid to digestion, and for use as a nutritive enema in cases requiring it.

Charcoal.—Dose, a teaspoonful after each meal. Put the charcoal in a tumbler, add a few drops of water, sufficient to make a thick paste, then dilute, stir, and take at once. The quantity may be increased somewhat without injury. If bran charcoal cannot be obtained, charcoal made from boxwood or cocoanut shells is next best in quality. The charcoal must be specially prepared.

℞.	Pure Pepsin,	dr. 1.	
	Charcoal,	dr. 2.	M.

Divide into thirty-two capsules or powders, and take one after each meal.

The best mode of taking charcoal is in capsules, as its properties are thus most thoroughly preserved.

For Constipation.—

℞.	Brown sugar,	tablespoonful 1.	
	Water,	pt. 1.	M.

Use when there is want of desire for movement of the bowels.

℞.	Common Salt,	dr. 1.	
	Aquæ,	pt. 1.	M.

Use same as preceding.

Soap and Water Enema.—Make a pretty strong solution of castile soap in warm, soft water. Use one pint to two quarts as may be necessary to secure a movement of the bowels. Useful in obstinate constipation. In very obstinate cases, common soap may be used instead of castile soap, being more powerful.

Camphor Water Enema.—To half a glassful of water, add ten to thirty drops of spirits of camphor and inject into the rectum half an hour after breakfast,—a most valuable remedy when constipation is the result of want of sensibility of the lower portion of the intestines. In severe cases the same quantity of camphor water should be injected into the rectum in the evening, and retained during the night.

Glycerine Enema.—One to two tablespoonfuls of glycerine should be used, with three or four times as much water. It is of service in the same class of cases as the preceding.

℞.	Extract of Cascara Segrada,	dr. 4.	
	Simple Sirup,	oz. 3.	M.

Dose.—A teaspoonful after each meal. A very mild vegetable laxative, to be taken in cases of constipation, in which correction of diet and the employment of the simple means suggested elsewhere in this work are not effective, and to avoid the habitual use of the enema. Its use should not be long continued. Hot water drinking, two or three glasses being taken before each meal, and at night, should be employed in all cases of constipation in connection with the prescription above given, unless contra-indicated by some other condition present.

For Hemorrhoids, or Piles.—The bowels may be kept regular by the use of the following prescription, if care respecting diet and the employment of other measures recommended elsewhere in this work are not effective:—

℞.	Fl. Extract Cascara Sagrada,	fl. dr. 4.	
	Simple Sirup,	fl. oz. 3.	M.

Dose.—A teaspoonful after each meal. The dose may be doubled without injury in obstinate cases; but the quantity taken should be gradually diminished until it can be discontinued without injury. When there is much tenderness and pain at stool, use the following by enema before going to stool, retaining it as long as possible, at least ten or fifteen minutes:—

℞.	Flaxseed (unground),	oz. 1.	
	Hot Water,	pt. 2.	M.

Allow to stand two hours before using. A small quantity of this infusion, half a pint, may be taken at night, and retained in cases of the sort mentioned.

The extract of hamamelis is an excellent remedy for use in these cases, and often affords great relief. It may be used in any of the following ways:—

℞.	Fl. Extract Hamamelis,	fl. oz. 2.	
	Glycerine,	fl. oz. 4.	
	Aquæ,	fl. oz. 10.	M.

Bathe the parts twice a day.

℞.	Fl. Extract Hamamelis,	fl. oz. 4.	
	Vaseline,	oz. 3.	M.

Rub well together. Apply this ointment to the parts, if sore and protruding, twice a day.

℞.	Fl. Extract Hamamelis,	dr. 2.	
	Cacao Butter,	dr. 6.	M.

Rub well together and make into suppositories, one to be used after the bowels move in the morning, and one at night.

℞.	Ac. Tannic,	gr. 20.	
	Cacao Butter, sufficient quantity,		M.

Make into ten suppositories. Use same as preceding.

℞.	Ac. Tannic,	gr. 30.	
	Iodoform,	dr. 1.	M.
	Cacao Butter, sufficient quantity.		

Make into sixteen suppositories, and use same as preceding.

For Colic. —

Charcoal is a useful remedy in cases in which the colic is due to the decomposition of the food in the stomach or bowels, both as a curative and as a preventive. Give a tablespoonful of finely powdered vegetable charcoal in half a glass of hot water. As a preventive, use a teaspoonful after each meal. In these, as in other cases where charcoal is required, the remedy is much more effective if used in capsules, and in much smaller doses.

℞.	Essence of Peppermint,	dr. ½.	
	Laudanum,	drops 2.	
	Hot Water,	oz. 2.	M.

Take at one dose.

℞.	Tr. Assafœtida,	dr. 1.	
	Starch Water,	oz. 2.	M.

Use by enema, to be retained. Useful in cases of hysterical colic.

℞.	Acid Carbolic,	dr. ½.	
	Simple Sirup,	oz. 4.	M.

Dose. — A teaspoonful in cases of colic with offensive breath.

For Dysentery. — In the acute stage of the disease, the employment of large enemata of hot water is generally efficient. If there is much pain and constant desire to relieve the bowels, use the following: —

℞.	Laudanum,	drops 10.	
	Starch Water,	oz. 1½.	M.

Introduce into the rectum once in four to six hours. Use one-third or one-half the above dose for a child.

The application to the rectum of a cloth or sponge wet in very cold water is often more effective than the opium mixture just described.

The following prescriptions are particularly useful in chronic dysentery: —

℞.	Lime-water,	pt 1.	
	Boiled Rain-water,	pt 1.	M.

Use by enema, retaining it as long as possible. This is especially serviceable to soften the mucus and clean out the ulcers.

℞.	Vegetable Charcoal,	dr. 1.	
	Bis. Subcarb.,	dr. 1.	M.

Divide into twelve powders, and take one three times a day. Will relieve the discharges of their offensive character.

℞.	Potass. Chlorat,	dr. ½	
	Glycerine,	oz. ½	
	Aquæ,	oz. 3.	M.

Inject two or three times a day, having the patient retain it as long as possible.

For Cholera Morbus. —

℞.	Tr. Opii.,	dr. 1.	
	Vini Gallici,	oz. 2.	M.

Dose. — A teaspoonful every two hours, to be taken in connection with fomentations applied to the abdomen, and hot enemas.

℞.	Bismuth Subnit.,	dr. 4.	
	Glycerine,	oz. 1.	
	Aquæ,	oz. 1.	M.

Dose. — One or two teaspoonfuls every hour, with other treatment as above suggested.

For Cholera Infantum. —

℞.	Bismuth Subnitrate,	dr. 1.	
	Aquæ,	oz. 3.	M.

Dose. — A teaspoonful once an hour. Particularly useful for the diarrhea which precedes cholera infantum.

The researches undertaken by Prof. V. C. Vaughan, of the University of Michigan, a few years ago, as the result of which he discovered the peculiar poison which he named tyrotoxicon, has thrown great light upon the cause of cholera infantum, possibly also cholera morbus. Tyrotoxicon is a poison which is found by the action of certain germs upon milk. It is always present in cheese. It may be obtained at any time by adding a quantity of cheese to a can of milk, sealing it up and laying it away for a few weeks.

In certain conditions, this poison is produced in the stomach. It is probable that the poisons produced in the stomach are generated by certain germs introduced with milk; hence, when infants are fed upon cow's milk, it should be sterilized. Children suffering from cholera infantum or cholera morbus should be fed upon thin, well-boiled, and carefully strained oatmeal or barley gruel, or a mixture of white of egg with water may be employed. Milk must be avoided until the symptoms of disease have passed away; then only sterilized milk should be used. In beginning the use of milk for an attack of cholera morbus, care should always be taken that it is well diluted. Cream diluted with barley gruel or lime-water is preferable to milk.

Torpid Liver. — Perhaps no purely functional disease is more common in this country than inactivity of the liver. This is undoubtedly owing to the bad dietetic habits of the American people. The difficulty is curable only by a removal of the cause; yet considerable benefit may be derived by the use of some simple remedies like the following: —

℞.	Ammonia Chloridi purificati,	oz. 1.	
	Peppermint water,	oz. 6.	M.

Take two teaspoonfuls three times a day with a pint of hot water. The large quantity of water is essential to the success of the remedy. The proper time to take it is one hour before breakfast and dinner, and just before retiring at night.

Taraxacum, or Dandelion Root. — This remedy was first used for functional troubles of the liver and bowels by Arabian physicians several centuries ago, since which time it has come into very general use, and probably possesses some virtue as a remedy in these cases, through its action upon the bowels, by which the liver is favorably affected.

℞.	Fl. Ex. Taraxacum,	fl. dr. 1.	
	Hot Water,	pt. ½.	M.

Take at one dose one hour before eating, three times a day.

℞.	Taraxacum Root (bruised),	oz. 1.	
	Cold Soft Water,	pt. 1.	M.

Bring to a boil in a covered vessel, boil ten minutes, strain, and add to the strainer enough water to make a pint of the decoction. Take four to six tablespoonfuls in a half pint of hot water before breakfast and dinner, and upon going to bed at night.

Hot Water. — One of the best of all remedies for a torpid liver is the free use of hot water. The water should be taken as hot as it can be swallowed without discomfort, and

should usually be taken in quantities of two to four glasses (half pints) three times a day. One hour before breakfast and dinner, and just before going to bed at night, are the best hours for taking the fluid, as when thus taken it does not interfere with the meals. We have recommended this practice in a very large number of cases, and have invariably found good results, the dinginess of the eye, muddiness of the skin, and red sediment in the urine disappearing in the course of a very few weeks, often in a few days.

We would not wish to hide from the reader our conviction that the greatest benefit to be derived from the foregoing medicinal prescriptions is due to the large quantities of water with which they are taken.

Bright's Disease of the Kidneys.—There is probably no disease for which less can be done by the use of drugs than this, owing to the fact that the disease disables a portion of one or both kidneys, producing such changes as can be removed by no remedy which can be administered. Medicines which act upon the kidneys are particularly harmful. The following simple remedies, however, we are able to commend as useful, and of far greater value than any of the much-vaunted and advertised quack nostrums, not excepting "Safe Liver and Kidney Cure," and other delusive remedies:—

Lemon Water.—To a pint of boiling water, add half a lemon cut in slices. Let it stand until cooled sufficiently to allow it to be sipped. Take three times a day, at least one hour before eating.

Cream of Tartar Whey.—To one pint of milk add a half teaspoonful of cream of tartar. Strain through a cloth, and drink the whey. Take this quantity three times a day. If the digestion is at all disturbed by the long continuance of the remedy, substitute the preceding.

Camphor-Vapor Bath.—Arrange the patient as directed elsewhere in this work for a hot-air bath. Place over the alcohol lamp a tin plate, and on this place two or three teaspoonfuls of camphor gum. This is an excellent bath for stimulating the skin in Bright's disease, and is also useful in chronic rheumatism.

℞.	Acid Carbolic,	fl. dr. 1.	
	Essence of Cinnamon,	fl. dr. 3.	
	Rain-water, boiled,	fl. oz. 6.	M.

An excellent lotion to apply to the legs after puncturing to allow accumulated fluid to escape, as is often necessary in cases of Bright's disease.

Ague, or Chills and Fever.—This disease should first be treated according to the directions given elsewhere in this work. If after a reasonable time the chills still continue to recur, the following remedies may be resorted to:—

℞.	Tincture of Camphor,	fl. oz. ½.	
	Hot Water,	pt. ½.	M.

Take fifteen minutes before the chill is expected. In many cases the chill may be prevented by this means, especially if the patient takes the additional precaution to be in bed surrounded by woolen sheets, and, if necessary, a good supply of hot jugs, bricks, or hot-water bags.

Amyl Nitrite is a remedy of established value for modifying the chill, and sometimes even averting it. Five or six drops should be placed upon a handkerchief, and inhaled.

A half teaspoonful of ***Chloroform*** in half a glass of milk, taken just at the time when the chill is expected, will often accomplish the same result.

Peruvian Bark, in one form or another, is the most reliable remedy for interrupting the paroxysms of this disease. It may be given in the form of ***quinine*** or ***chinoidine.*** Of the former, two to four grains may be given at intervals of four hours, beginning twenty-four hours before the expected chill. The dose of chinoidine must be about twice as great. The chinoidine may be made into pills, and twenty taken; the quinine is best taken in the form of capsules or sugar-coated pills.

Eucalyptus, the oil obtained from the tree of that name, has lately acquired a reputa-

tion as an anti-periodic. The dose is half a teaspoonful of the oil to be taken in mucilage or milk.

Aconite, in drop doses of the tincture, may be used hourly for two or three hours during the febrile stage in addition to the cool sponging recommended in our description of the proper treatment of this malady. When perspiration begins, the remedy should be continued. It has no curative influence, but shortens the febrile stage.

For Bladder Difficulties. — The following are a few of the prescriptions which we have found of greatest service in the treatment of cases requiring the use of the bladder douche.

℞.	Common Salt,	dr. 1.	
	Aquæ,	pt. 1.	M.

Excellent for simply cleansing the bladder, or distending it when contracted.

℞.	Bi-carbonate of Soda,	gr. 16.	
	Aquæ,	pt. 1.	M.

Use when urine is acid, or shows a brick-dust deposit.

℞.	Boracic Acid,	dr. 1.	
	Aquæ,	pt. 1.	M.

Useful as a cleansing injection, and in cases of acute catarrh of the bladder.

℞.	Ex. Hydrastis (aqueous),	f. dr. 2.	
	Aquæ,	pt. 1.	M.

Useful in chronic catarrh of the bladder. The strength may be increased by degrees.

For Mouth and Throat Diseases. — The following prescriptions we have tested by experience, and know to be of real value in the treatment of the conditions for which they are recommended: —

℞.	Borax,	dr. ½.	
	Glycerine,	f. oz. 1.	M.

Apply with camel's-hair brush or swab in thrush or aphthæ.

℞.	Chlorate of Potash,	dr. 1.	
	Aquæ,	f. oz. 4.	M.

Use as gargle in sore mouth or sore throat.

℞.	Acid, Carbolic,	dr. ½.	
	Glycerine,	f. oz. 1.	
	Aquæ,	f. oz. 3.	M.

Apply to throat in severe diphtheria with fetid breath, by means of atomizer or swab.

℞.	Chlorinated Soda Solution,	oz. ½.	
	Aquæ,	f. oz. 3.	M.

Use as gargle or with atomizer in diphtheria when the breath is foul.

℞.	Acid Tannic,	gr. 10.	
	Glycerine,	f. oz. 1.	

Apply to back of throat with brush or swab in cases of chronic sore throat, with relaxed uvulæ.

℞.	Chloride of Sodium (Common Salt),	dr. ½.	
	Aquæ,	f. oz. 4.	M.

Inhale spray with atomizer three times a day for acute hoarseness from a cold.

℞.	Acid Tannic,	gr. 4.	
	Aquæ,	f. oz. 1.	M.

Inhale spray daily for chronic sore throat and hoarseness.

℞.	Alum,	gr. 5.	
	Aquæ,	f. oz. 1.	M.

Use for same purpose as the preceding.

For Croup.—In treating this disease, the chief reliance must be placed upon cold applications to the throat, and other measures elsewhere recommended in this work; but the following prescriptions will be found of service in relieving the conditions for which they are recommended:—

℞.	Alum, powdered,	dr. 4.	
	Honey or Molasses,	oz. 1.	M.

Dose.—Two teaspoonfuls once in half an hour until vomiting is produced. To be used only where the breathing is greatly obstructed, and the patient gets no relief by coughing.

℞.	Acid Carbolic,	dr. 1.	
	Glycerine,	oz. 1.	
	Aquæ,	oz. 5.	M.

Inhale one-half ounce every two hours. Is very useful in allaying the inflammation.

℞.	Bromine,	drops 4.	
	Potass. Bromid.,	dr. 1.	
	Aquæ,	oz. 4.	M.

Inhale with steam atomizer to dissolve membrane. Repeat as needed.

Lime.—This is one of the very best agents for dissolving the false membrane. It may be used as lime-water, with a steam atomizer, or by inhaling the vapor arising from slacking lime as follows: Put freshly burned lime in a pan. Pour on boiling hot water. Cover the pan with a large paper funnel, or a stiff paper bag one corner of which has been cut off, and allow the patient to inhale the vapor through the aperture. Care must be taken to avoid burning the patient at first, while the vapor is very hot. When properly used, this is undoubtedly the best known means of combating the worst feature of this grave disease. It is also useful in diphtheria, when there is danger of suffocation from the false membrane.

For Consumption.—

Lime-Water.—The use of lime-water and milk, in the proportion of one part of lime-water to three parts of milk, two to four pints to be taken in a day, is a very effective dietetic remedy in this disease.

Carbolic Acid has been much extolled as a remedy for consumption. It has been administered by a variety of methods, chiefly in solution by the mouth, by hypodermic injection, and by inhalation. The following is a good formula for inhalation with the atomizer:—

℞.	Acid Carbolic,	drops 2.	
	Aquæ,	oz. 7	M.

Use two or three times a day.

The following we have found less irritating and more acceptable in some cases, with effects fully as beneficial:—

℞.	Oil of Wintergreen,	drops 4.	
	Alcohol,	dr. ½.	
	Glycerine,	dr. 2.	
	Aquæ,	dr. 5.	M.

Use with atomizer, one-half ounce, three or four times a day.

Benzoate of Soda has enjoyed a great reputation as a curative agent in consumption, though larger experience has not confirmed the first enthusiastic accounts of its merits.

℞.	Benzoic Acid,	gr. 10.	
	Carbonate of Soda,	gr. 10.	
	Aquæ,	oz. 2.	M.

Use with atomizer, one-half ounce, two or three times daily.

The ***Compound Tincture of Benzoin*** is a very soothing remedy, often relieving a very distressing cough. Ten to twenty drops may be used in the steam inhaler several times a day, or a half dram of the tincture may be added to a pint of boiling water in an open vessel, and the steam inhaled through a paper funnel. The ***Gum Benzoin*** has been em-

ployed in a somewhat rude though effective manner, a piece of the gum the size of a hazel-nut being placed on a hot shovel, and the fumes inhaled.

Iodoform, though not very agreeable, is a useful remedy, especially where there is ulceration of the larynx. A dram of iodoform should be mixed with a half ounce of starch, and the fumes inhaled from the mixed powder spread upon paper.

Iodine sometimes relieves a troublesome cough when used as follows:—

Add a dram of tincture of iodine to an ounce of water. Apply gentle heat, and inhale the fumes cautiously.

Cod-Liver Oil once enjoyed a very great reputation for the cure of consumption; but it is now generally admitted that its merits were greatly exaggerated, and no less an authority than Prof. Walsh, of the University College Hospital of London, admits that it is open to many objections, of which the following are a few: 1. It often disagrees with the digestion of the patient, producing nausea, loss of appetite, and diarrhea; 2. It is injurious in cases of inflammation of the lung tissues and hemorrhage; 3. Its beneficial effects are not marked in incipient cases; 4. Although the patient may seem to be benefited, the weight being apparently increased, the disease may be making steady advancement all the time; 5. It is injurious in cases in which there is enlargement or fatty degeneration of the liver. Experience with a large number of cases of this disease has convinced the author that sweet cream and rich milk are quite as beneficial as cod-liver oil, much more easily assimilable, and free from the objections urged against the latter.

Olive-Oil and ***Cocoa-Nut Oil*** are very useful as external remedies. They may be used interchangeably, care being taken to secure an absolutely pure article, which is difficult as regards olive-oil. Cocoanut oil is likely to be slightly rancid. It must be kept in a cool place, in a tightly-corked bottle, or covered with lime-water. Apply the oil daily after a saline sponge, with considerable friction of the surface.

Saline Sponge Baths are of great service in checking night sweats and improving the circulation. They may be employed either quite hot, 120° F., or tepid, about 92° F. If used to relieve night sweats, the bath should be given at bed-time.

Vinegar Baths are also serviceable for the same purpose. Use one part of good cider vinegar to three parts of water.

Alcohol Baths are still more effective in some cases. One part of alcohol should be employed with three of water, and may be applied either hot or tepid.

For Catarrh.—

℞.	Common Salt,	dr. 1.	
	Aquæ,	pt. 1.	M.

Draw into the nose from the hand or a sponge, or use with nasal or post-nasal douche. Useful in cases in which there is a profuse discharge, with or without a tendency to form scabs. As a cleansing solution, it is good in most cases of catarrh.

℞.	Sulphate of Zinc,	dr. 1.	
	Aquæ,	pt. 1.	M.

To be used in the same way as the preceding, after cleansing the nasal cavities with the salt solution. May be still better used by means of the hand atomizer. Useful in cases in which there is a profuse discharge and dropping at the back of the throat.

℞.	Sulphate of Iron,	dr. 1.	
	Aquæ,	pt. 1.	M.

Use same as the preceding.

℞.	Ferric Alum,	dr. 1.
	Aquæ,	pt. 1.

Use same as preceding. A very excellent remedy.

℞.	Tannic Acid,	dr. 1.	
	Aquæ,	pt. 1.	M.

Use same as the preceding. In some cases a vegetable astringent produces better results than the mineral.

℞.	Potass. Permanganate,	dr. ½.	
	Aquæ,	pt. 1.	M.

Use same as preceding in cases of catarrh accompanied by an offensive odor.

℞.	Extract of Witch-Hazel (distilled),	oz. 2.	
	Aquæ,	oz. 2.	M.

Use in same manner as preceding in cases in which there is dryness of throat and nose from insufficient secretion.

℞.	Borax,	dr. 1.	
	Bi-carbonate of Soda.	dr. 1.	
	Glycerine,	f. oz. ½.	
	Aquæ,	pt. 1.	M.

An excellent cleansing solution, to be used in cases of chronic catarrh as a preparation for the application of other remedies. Use with atomizer.

℞.	Chlorate of Potash,	dr. 1.	
	Aquæ,	pt. 1.	M.

Use with atomizer in cases of catarrh with an irritating discharge.

℞.	Oil, Eucalyptus,	dr. ½.	
	Oil, Petrolina,	f. oz. 3.	M.

Use daily with atomizer in cases of dry catarrh.

℞.	Boracic Acid,	dr. 1.	
	Powdered Gum Acacia,	dr. 2.	M.

Use as a snuff in cases of catarrh with offensive discharges, after cleansing.

For Pneumonia.—

℞.	Tincture Aconite,	drops 16.	
	Aquæ,	oz. 2.	M.

Dose.—A teaspoonful every half hour for two hours, then every hour for three hours.

℞.	Bicarbonate of Potash,	dr. 3.	
	Gum Water,	oz. 3.	M.

Dose.—A teaspoonful in water every three or four hours. It delays the cough and facilitates expectoration. Fomentations should be applied to the chest at the same time after the first day.

For Neuralgia.—Applications of heat in the form of a hot bag or brick, or hot fomentations, or in some cases the employment of ice or iced water, are most effective means of relieving neuralgia, as a rule. When these fail, however, the following may be tried:—

℞.	Atropia Sulph.,	gr. 5.	
	Aquæ,	oz. 3.	M.

Soak a cloth in the solution and apply over the painful part, covering the compress with oiled silk or muslin, and changing every hour or two.

℞.	Menthol,	dr. 3.	
	Oil of Wintergreen,	dr. 1.	
	Oil of Peppermint,	dr. 1.	
	Alcohol,	oz. 3.	M.

Use as a liniment. One of the most efficient of all remedies for the relief of pain by external application.

For Lumbago.—Employ the same remedies recommended for neuralgia. The following are also very effective remedies:—

℞.	Extract Cascara Sagrada,	dr. 4.	
	Aquæ,	oz. 2.	M.

Dose.—A teaspoonful three times a day until the bowels are loose. At the same time drink ten to twelve glasses of hot water daily. Two or three glasses should be taken an hour before each meal, and at night, on going to bed.

℞.	Bicarbonate of Soda,	℔. ½.	
	Aquæ,	gals. 2.	M.

Heat to boiling, and apply to the loins by means of flannel cloths wrung out sufficiently dry to prevent dripping.

For "Poison Ivy" or "Poison Sumach."—

℞.	Ammonia Water,	oz. 1.	
	Glycerine,	oz. 1.	
	Aquæ,	oz. 4.	M.

Apply as soon after contact as possible.

℞.	Saleratus or soda,	oz. ½.	
	Aquæ,	oz. 8.	M.

Soft soap may be employed in the absence of the above. The poisonous principle is an acid, which must be neutralized by an alkaline wash of some kind, of which the above prescriptions are the best.

For Nettle Sting.—

Use same prescriptions recommended for "Poison Ivy," and also the following:—

℞.	Acid Carbolic,	dr. 1.	
	Glycerine,	oz. ½.	
	Ammonia Water,	oz. ⅔.	
	Aquæ,	oz. 5.	M.

Bathe the part affected.

Palpitation of the Heart.—This affection is often due to indigestion, the use of tobacco, tea, or coffee, masturbation, and marital excesses. It is also a frequent accompaniment of the general disturbances occurring at the change of life. It is very common with nervous invalids, particularly young women. When due to organic disease of the heart, a permanent cure cannot be effected; but in other cases it disappears on removal of the cause, which should be the first matter of attention, after which the following remedies and measures may be employed:—

℞.	Tinct. Aconite,	drops 10.	
	Water,	glassful ½.	M.

Take a teaspoonful every fifteen minutes for an hour or two.

Camphor is a valuable remedy in these cases. A tablespoonful of ***Aqua Camphoræ***, or a half teaspoonful of the tincture in a little sweetened water, is the proper dose.

℞.	Ol. Eucalyptus,	fl. dr. 1.	
	Olive or Almond Oil,	fl. oz. 2.	M.

A teaspoonful in two tablespoonfuls of milk is very effective in relieving the palpitation incident to the change of life.

A Belladonna Plaster worn over the region of the heart, is often very effective.

Posture is an excellent means which should always be tried. The patient should bend the body forward, allowing the arms to hang down and holding the breath for a few seconds.

Pressure upon the large vessels of the neck, making firm pressure with the thumbs upon both sides at once for a quarter of a minute at a time, is a very effective means of relieving nervous palpitation.

Ice, contained in a rubber bag, should be worn over the region of the heart when the palpitation is persistent and does not yield to other treatment.

For Diarrhea.—

℞.	Cinnamon Water,	oz. 3.	
	Subcarbonate of Bismuth,	oz. 1.	M.

Dose.—A teaspoonful once in three or four hours.

This is especially serviceable in diarrheas due to intestinal irritation. Excellent in most cases of diarrhea in children, for whom the dose should be one-half to one-third that given above.

℞.	Tincture of Coto bark,	dr. 4.	
	Simple Sirup,	oz. 2.	M.

Dose.—One to two teaspoonfuls once in three hours.

Useful in both acute diarrhea and the diarrhea of consumption.

℞.	Tincture Quassia,	oz. 2.	
	Hot Water,	qts. 2.	M.

Use by enema while hot, the whole quantity twice a day. Especially serviceable in cases of diarrhea due to irritation produced by retained fæces.

For Hiccough.—Have the patient lie on the left side. If the hiccough does not soon cease, give snow or ice-pills freely. Apply a fomentation or a mustard plaster over the stomach. A strong current of faradic electricity may be applied over the region of the diaphragm with good effect in most cases. Failing in these measures, try the following:—

℞.	Tinct. Physostigmatis,	fl. dr. 1.	
	Potass. Carb.	dr. 1.	
	Mist. Acacia,	fl. dr. 6.	M.

Dose.—A teaspoonful at intervals of an hour or two if the first is not effective, or three times a day in chronic hiccough, for which it is especially useful.

Five drops of chloroform administered on a lump of sugar is useful when other measures fail.

A dyspeptic hiccough may be relieved by two or three glasses of hot water taken rapidly, or a little "mint and soda" in hot water if the stomach is acid.

For Sore Nipples.—The following are a few of the most efficient remedies for use in cases of sore or cracked nipples:—

℞.	Alum or Borax,	gr. 15.	
	Whisky,	f. oz. 1.	M.

Apply to surface twice a day when tender but not raw, for the purpose of hardening.

℞.	Zinc, Sulphas,	gr. 10.	
	Aquæ,	f. oz. 2.	M.

Apply daily when slightly abraded or cracked.

℞.	Tannic Acid,	gr. 15.	
	Glycerine,	f. oz. 1.	M.

Apply after cleansing the part, twice a day.

℞.	Tannic Acid,	dr. 3.	
	Glycerine,	f. dr. 1.	
	Aquæ,	f. dr. 2.	M.

Vaginal Lotions for Leucorrhœa.—The following are a few of the most serviceable prescriptions for use by injection into the vagina in the treatment of vaginal and uterine affections:—

℞.	Tannic Acid,	oz. 2.	
	Glycerine,	f. oz. 1.	M.

Add a teaspoonful to a pint of cold water, and use daily after hot douche in mild cases of leucorrhœa.

℞.	Boracic Acid,	oz. 1.	
	Aquæ,	pts. 2.	M.

Inject one-half pint after hot douche daily, in leucorrhœa, particularly when there is an acid or irritating discharge.

℞.	Alum,	dr. 2.	
	Ac. Tannic,	dr. 1.	
	Aquæ,	pt. 1.	M.

Use after hot douche daily, in leucorrhœa or chronic congestion of the womb.

℞.	Alum,	dr. 1.	
	Decoction of Oak Bark,	pt. 1.	M.

Use daily after hot vaginal douche in leucorrhœa.

℞.	Hops,	oz. 1.	
	Hot Water,	pt. 1.	M.

Let stand over night. Inject after hot douche in cases of leucorrhœa in which there is much irritation.

For Vaginal Pledget.—

℞.	Tannic Acid,	oz. 1.	
	Glycerine,	f. oz. 4.	M.

Dissolve, use daily, or three times a week, alternating with pure glycerine or vaseline. Useful in cases of subinvolution of the vagina and womb, enlargement of the womb, and profuse leucorrhœal discharge. It will be necessary to dilute the preparation with an equal quantity of glycerine in many cases at first.

℞.	Acid Carbolic,	dr. 1.
	Glycerine,	f. oz. 12.

Mix thoroughly.

This is useful as an alternate for the preceding, and in all cases in which glycerine is indicated. It may be used instead of the preceding when the vagina is tender, alternating with the vaseline pledget until the parts will bear the tannin preparation. It is a very healing preparation.

℞.	Iodoform,	dr. 2.	
	Balsam Peru,	f. dr. 1.	
	Glycerine,	f. oz. 1.	M.

Very useful in cases of ulceration or abrasion of the neck of the womb, and when there is an irritating or offensive vaginal discharge.

℞.	Iodoform,	dr. 1.	
	Tannic Acid,	dr. 2.	
	Glycerine,	f. oz. 1½.	M.

Of special service in profuse, excoriating leucorrhœa. Apply daily.

℞.	Ex. Eucalyptus,	f. oz. 2.	
	Glycerine,	f. oz. 2.	M.

Apply daily.

This new remedy we have found exceedingly valuable as a means of relieving the harassing neuralgic pains so common in cases of chronic disease of the womb and ovaries. It is also useful in cases in which there is an offensive leucorrhœal or menstrual discharge.

For Vaginismus.—

℞.	Iodoform,	dr. ½.	
	Vaseline,	dr. 4½.	M.

Useful in cases of painful contraction, or vaginismus. The ointment should be applied on a little plug of charpie or lint, which should be gradually increased in size from day to day until the painful contraction is overcome. If the odor is very objectionable, a little Balsam of Peru may be added.

℞.	Ex. Bella.,	dr. 1.	
	Vaseline,	oz. 1.	M.

Apply on charpie as directed for the preceding.

For Irritable Vulva.—

℞	Borax,	dr. 1.	
	Aquæ,	oz. 4.	M.

Apply to the vulva when irritable, using lint or soft linen cloths for the purpose.

℞.	Acid, Boracic,	dr. 1.	
	Aquæ,	oz. 4.	M.

Apply same as preceding, and for same purpose.

℞.	Acid, Carbolic,	f. dr. 1.	
	Glycerine,	f. oz. 1.	
	Aquæ,	f. oz. 15.	M.

Apply with lint or soft cloths in cases of inflammation of the vulva.

For Gonorrhœa and Gleet.—

The best of all measures is the hot urethral douche. This may be taken by the aid of a fountain syringe, or by a pail, and a rubber tube six or eight feet long, and an ordinary soft rubber catheter. The catheter should be passed into the urethra to a point an inch or two in front of the bladder, so that the canal will be cleansed throughout its entire length. The quantity of water should be one or two gallons, and the temperature as hot as can be borne, or beginning at 105° F. and gradually increasing to 120° F., or even higher. After this treatment, which is equally beneficial and essential in both gleet and acute gonorrhœa, some one of the following prescriptions may be employed:—

℞	Carbolic Acid,	dr. 1.	
	Gum Water,	oz. 8.	M.

Use with urethral syringe, half an ounce two or three times a day in acute cases in which there is much irritation or soreness.

℞.	Bismuth Subnitrate,	dr. 4.	
	Gum Water,	oz. 4.	M.

Use same as preceding, shaking just before using.

℞.	Tannic Acid,	dr. ½.	
	Carbolic Acid,	dr. 1.	
	Glycerine,	oz. 2.	
	Aquæ,	oz. 12.	M.

Use half ounce twice a day in recent cases.

℞.	Hydrastin,	dr. 1.	
	Gum Water,	oz. 4.	M.

Use half ounce twice or three times daily in acute cases.

℞.	Oil Copaiba,	oz. ½.	
	Powdered Gum Acacia,	oz. 1.	
	Aquæ,	oz. 8.	M.

Use half ounce twice a day in cases of gleet.

℞	Cider Vinegar,	oz. 2.	
	Aquæ,	oz. 6.	M.

Use same as preceding, gradually increasing the proportion of vinegar until nearly pure vinegar can be used.

For Syphilis.—

It ought to be stated at the outset that no medicine will absolutely cure this disease. Mercury and some other remedies will cause a disappearance of the symptoms, but the disease may still be lurking in the system. We can only recommend the following:—

℞.	Potass. Iodide,	dr. 1.	
	Syr. Sarsaparilla,	oz. 3.	M.

Take a teaspoonful three times a day with a glassful of water. Most efficient in the later stages of the disease.

℞.	Tinct. Iodine,	dr. 1.	
	Tinct. Opii,	dr. 1.	
	Aquæ,	oz. 5.	M.

Use as gargle in painful syphilitic ulceration of the throat.

℞.	Sulphuric Acid (concentrated),	dr. 1.	
	Powdered Charcoal sufficient to form a paste.		

Useful for destroying a chancre. A little of the paste should be applied and retained for a few minutes. Nitric acid may be used for the same purpose without mixing with the charcoal.

Lotions for the Skin.—

℞.	Comp. Tr. Benzoin,	dr. 4.	
	Alcohol,	oz. ½.	
	Glycerine,	oz. 1.	
	Water,	oz. 2.	M.

An excellent lotion to cure and prevent chapping of hands. A small quantity rubbed on the hands after washing, morning and night, will keep the skin soft and healthy. Also an excellent lotion for the face, clearing the skin, and removing freckles caused by wind and sun.

℞.	Zinc Sulphate,	dr. 1.	
	Rose-Water,	pint 1.	M.

Apply to face twice daily to remove redness and pimples.

℞.	Borax,	dr. 1½.	
	Carbonate of Soda,	dr. 1½.	
	Carbonate of Ammonia,	dr. 2.	
	Aquæ Ammonia,	dr. 4.	
	Glycerine,	oz. 1.	
	Water to make	oz. 6.	M.

An excellent lotion for cleansing the hands. Much better than most of the lotions sold for this purpose, and less expensive.

Disinfectant Lotions.—

℞.	Copperas,	lb. 2.	
	Water,	gal. 1.	M.

Disinfectant lotion for use with scarlet fever and diphthèria patients, as directed elsewhere.

℞.	Sulphate of Zinc,	lb. ½.	
	Aquæ,	gal. 1.	M.

Disinfectant lotion for cleansing cloths used in connection with diphtheria and scarlet fever patients.

℞.	Potassium Permanganate,	oz. 2.	
	Aquæ,	gal. 1.	M.

Keep in jug or glass bottle. A teacupful should be placed in the vessel which receives the discharges of a diphtheritic or scarlet fever patient.

NEW REMEDIES.

The following are among the most important of the new measures of treatment which have been recently developed :—

Sulphate of Copper.— All the metallic salts possess valuable properties as germicides ; but sulphate of copper is one of the most useful of all. It should be used in the proportion of one ounce to the gallon of water. It also possesses valuable properties as a deodorant. It should be remembered that all salts of copper are poisonous. The solution must be used very freely to secure satisfactory results.

Lactic Acid.— This organic acid is naturally produced by the fermentation of milk, in which sugar of milk, or lactose, is decomposed, producing lactic acid. According to the experiments of Hayem and Winter, of Paris, which we also have verified in the Physiological Laboratory of the Battle Creek (Mich.) Sanitarium, lactic acid is useful as an aid to digestion. We have found it most useful in those cases in which there is failure of the digestive fluids to completely and perfectly convert the nitrogenous elements of the food. It may be taken in doses of fifteen or twenty drops, properly diluted with water. It should be taken immediately after eating. In the green diarrhea of children, it is also very useful. Administer every hour, a teaspoonful of a solution made by mixing one teaspoonful of lactic acid in a tumblerful of water sweetened with a little sugar or honey. Recent experiments have shown that lactic acid is a germicide, and that it is useful in destroying the germs in the stomach and intestines.

Kumyzoon affords a most excellent means, probably the best of all, for administering lactic acid. Kumyzoon is similar to kumyss, differing only in that it is made from sterilized milk and contains no sugar. It is made by means of a special ferment, and not by the addition of yeast and sugar, as in kumyss. Cottage cheese also contains lactic acid, and is wholesome if care is taken to boil the sour milk in converting it into cheese.

Aristol.— This drug, similar to iodoform in character, is an excellent antiseptic, and may replace iodoform for most of the uses for which it is valuable. It may be used as a dry powder for insufflation in œzena ; is an excellent application for chronic ulcers, upon which the powder should be dusted thickly. It is especially useful in varicose ulcers and in suppurating wounds of all sorts. It is almost odorless, and is entirely free from the disgusting odor of iodoform.

Creosote.— This well-known drug has within the last few years acquired a well-deserved reputation as a remedy in tuberculosis, or consumption of the lungs. Pure beechwood creosote (carbolic acid cannot be used as a substitute, as it is poisonous in doses in which creosote may be safely used) should be used in doses of ten to thirty minims, or from one-sixth to one-half a dram. Being somewhat irritating to the stomach, it should be administered only by enema and on alternate days. It must be mixed in a suitable emulsion. We have used the following formula for a number of years, with good results :—

℞	Oil of sweet almonds,	3 oz.	
	Beechwood creosote,	1 dram.	
	Menthol,	8 gr.	
	Yolks of four eggs.		M.

Beat well together and add distilled water sufficient to make 30 ounces

Each ounce of this mixture contains two minims of creosote. The beginning dose should be four ounces, and should be administered every other night, gradually increasing the dose by one or two ounces each time until the patient takes ten or twelve ounces of the mixture. It should not be administered more frequently than every other day. The best time for administration is after retiring. The urine should be carefully watched. If it assumes a smoky appearance, the remedy should be discontinued for a time.

Creosote may also be used by inhalation. It may be best employed with the Perfection Vaporizer (see page 1594). It may be used in combination with benzoin, oil of cinnamon, oil of wintergreen, or oil of eucalyptus.

Antipyrin, Antifebrin, Phenacetin, Acetanilid.— These drugs belong to what is called the aromatic series of coal tar products. They all, to some extent, relieve pain and reduce the temperature. If their use was followed by no harmful effects, they would be of inestimable value as remedial agents, but unfortunately all these drugs are deadly poisons. They depress the heart's action; and two of them, phenacetin and acetanilid, dissolve the red blood corpuscles when taken in any but small quantities. Their free use is always attended by danger, as death has followed the employment of these drugs in ordinary doses, doubtless in consequence of some individual peculiarities on the part of the patient. Drugs of this sort should never be used except under the immediate supervision of a skillful physician. There are other and better means of reducing temperature which should receive preference.

Bismuth Ointment.— This is a most admirable remedy for use in burns. It should be thickly spread over the injured part. It is also

invaluable as a remedy in acute eczema and in all acute irritations of the skin, such as chafing, chilblains, and sunburn.

℞	Bismuth subcarbonate,	1 oz.
	Yellow vaseline, or lanolin,	3 oz.

Boric or Boracic Acid.— This substance is sold as a fine white powder. In a dilute solution (four grains to the ounce) it is an excellent remedy for irritation of the eyelids, or what is commonly termed mucous conjunctivitis. It should be used freely several times a day. Its great value, however, is in the treatment of suppuration of the middle ear. The ear should be thoroughly washed out, and then carefully dried with a bit of absorbent cotton applied with the end of a toothpick, and the canal packed full of the dry, powdered boric acid, or with a mixture consisting of equal parts of boric acid and subnitrate of bismuth. Boric acid mixed with twice its weight of carbonate of zinc is valuable as a dry powder in acute eczema and other irritations of the skin.

An excellent remedy for fetid perspiration and oily skin is the following: —

℞	Boric acid,	4 drm.	
	Distilled extract of hamamelis,	1 pt.	M.

Boro-Glyceride.— Two parts of boric acid boiled with three parts glycerine until chemical combination takes place. The mixture is then diluted with an equal quantity of glycerine. It is an excellent remedy for sunburn and for chronic eczema of the hands and soles of the feet, and for other parts in which the skin is thickened by eczema.

Essential Oils.— It has been long known that the essential oils are possessed of antiseptic properties. The most valuable are oil of cinnamon, oil of wintergreen, and oil of eucalyptus. The antiseptic properties of these oils may be utilized in a number of ways, particularly by inhalation, for the treatment of disease of the nose, throat, and lungs, and, in dilute solutions, for disinfection of the mouth. Cinnamon probably possesses antiseptic properties in the highest degree of any of the essential oils. Either of the others mentioned may be used for the nose, throat, and lungs by means of the Perfection Vaporizer.

On pages 1594 and 1595 will be found a description of the Perfection Vaporizer, with a number of formulæ for the use of essential oils.

The effects of these remedies are, first, to discourage the growth of germs in the respiratory passages. This is exceedingly advantageous, for the reason that it is now known that chronic diseases of the nose and throat are chiefly due to the action of microbes. The second effect from the use of these oils is to promote the free flow of serum, which

serves to cleanse the nasal surface, and also destroys the microbes growing upon it. The best effects obtained from their use, are due, as before stated, to the fact that they retard the growth of microbes. Even when administered in quantities too small to be capable of destroying the germs, they prevent the quantity from becoming so great as to break down the resistance of the tissues.

Cascara Sagrada.— The fluid extract of this herb, a native of California, is one of the most valuable drugs for use in chronic inactivity of the bowels. It is not by any means a panacea, but, for temporary use, is preferable to many of the older and more drastic drugs. It should be used in doses of from ten to twenty minims of the fluid extract. A dose may be taken at night and another before breakfast in a little water. The ordinary fluid extract is very bitter. Several preparations are made which retain the activity of the drug without the bitterness.

Iodized Starch.— This is a valuable remedy in cases of intestinal catarrh affecting the lower bowels. It may be used in doses of a half dram dissolved in a pint of warm water. It is useful as an intestinal disinfectant when used in this manner. Iodized starch contains five per cent of iodine.

Glyceride of Starch.— This preparation is a solution of starch in glycerine containing ten per cent of starch. It is an excellent emulsion for application to the skin. It is a little too irritating for raw surfaces. It may be used for chilblains, sunburn, chapped hands, and all cases of slight irritation of the skin.

Menthol.— This is one of the most valuable of the new remedies. It is a sort of camphor made from peppermint. Menthol was first imported from China, but is now made in large quantities in this country. It is a valuable antiseptic and anodyne. Dissolved in alcohol, it is a most excellent liniment. The following is a useful formula : —

℞	Menthol crystals,	oz. 2.	
	Alcohol,	pt. 1.	M.

For relief of acute cold in the head, there is probably no remedy of greater value than menthol. The best mode of using it is in connection with the essential oils,— eucalyptus, cinnamon, and wintergreen,— by means of a Perfection Vaporizer. An excellent formula is given on page 1595.

Animal Extracts.— The possible utility of animal extracts as remedies for disease was first brought to the notice of the profession by Professor Brown-Sequard, of Paris. The writer was a visitor to the laboratory of the renowned professor in Paris, at the time that he was making his earli-

est experiments in this direction. Since the first experiments of Brown-Sequard, in which extracts of the sexual glands were made, extracts have been made of the brain, thyroid gland, and of various other tissues, and their use is claimed to be effective, but it must be acknowledged that as yet the value of these extracts has not been established upon a sound basis. Certain parties in this country have placed themselves in the category of quacks by making extracts of the stomach, intestines, liver, and almost every structure of the body, and widely advertising them with most extravagant and fallacious representations in the public prints. In the opinion of the writer, the preparations last referred to are worthless, and probably little value attaches to animal extracts of any sort.

Malt Extract.— There are two principal classes of malt extracts, the fermented and the unfermented. The fermented extracts of malt contain little or no sugar or maltose, and have in their composition about four or five per cent of alcohol. Some possess more alcohol than this, and are practically no more than concentrated lager beer. These malt extracts are not to be recommended.

The saccharine extracts of malt are, however, valuable. They are usually of a dark-brown color, and have the consistency of syrup or honey. They have a sweet, slightly bitter taste, the sweetness being due to the maltose which they contain. They also contain diastase, a starch-digesting principle. Used in doses of one or two tablespoonfuls after each meal, these malt extracts are often very useful in cases of indigestion, particularly in those cases in which the stomach digestion of starch is imperfectly performed. It seems hardly probable that the benefit derived from malt extracts is due to the diastase which they contain, as the activity of malt in digesting starch is but little greater than that of saliva, and a little more chewing of the food would consequently be quite as useful as the taking of a considerable quantity of malt extract. It seems quite probable that the maltose, as well as the diastase, may have some value in aiding or regulating the digestive process as yet not fully understood. It is doubtless a peptogen of great value.

Malted Milk.— This is a valuable preparation of milk containing malt and maltose produced by the action of malt upon the starch. It is highly nourishing, and differs from ordinary milk in that it does not form hard curds in the stomach and is adapted to many adults and children who cannot use cows' milk.

Malted Gluten.— This preparation, devised by the writer, has been found useful in cases of invalids who require highly nourishing and digestible food, capable of producing and increasing both blood and fat, but who are unable to digest starch, and to whom the use of milk and

a meat diet are objectionable. It serves an admirable purpose for this class of patients, and has proven of very great service in their management. It is manufactured by the Modern Medicine Co., Battle Creek, Mich.

Papoid and Bromaline.— These are two digestive principles which, like pepsin, are capable of dissolving meat, boiled white of egg, and other albuminoid substances. They differ from pepsin, however, in that they are of vegetable origin, and are active in a neutral or alkaline as well as in an acid medium, whereas pepsin acts only in an acid medium. They are to be highly recommended as substitutes for pepsin, the action of which is frequently accompanied by the formation of a poisonous substance known as pepto-toxine.

Grindelia.— The fluid extract of this plant, a native of California, is of great value in cases of poisoning by poison oak or ivy. The parts should first be bathed with soda solution (a dram of soda to a pint of water with ten drops of carbolic acid), to which a few drops of carbolic acid should be added; then cloths wet in a solution of the fluid extract of grindelia with four or five ounces of water, should be applied over the inflamed parts. It is also highly recommended as a palliative in cases of asthma. Fifteen or twenty drops are taken every hour or two until the paroxysm ceases.

Ichthyol.— This is a tarry preparation made by the distillation of fossil fishes found in the Tyrol. It is valuable in many skin diseases, particularly in eczema, psoriasis, chilblains, and burns, for which it should be used in a ten per cent ointment, or one part ichthyol to one part vaseline or lanolin. It is also valuable for enlarged lymphatic glands. It should be used as an ointment, ichthyol constituting one-fifth of the preparation.

For irritable rectum and hemorrhoids we have found it also a very valuable remedy. We most frequently use it by painting a little pure ichthyol upon the affected parts. It is slightly anodyne, and quickly relieves a painful and swollen hemorrhoid when used in this way.

Kumyzoon.— This is a substitute for kumyss devised by the author, and possesses the following advantages over kumyss: —

1. It is made of milk which is thoroughly sterilized by heating at a temperature above the boiling point of water.

2. It is made without the addition of cane sugar, hence is practically free from alcohol and acetic acid, which are present in considerable quantities in ordinary kumyss, and is also free from cane sugar.

3. The lactic acid fermentation is induced by means of a special ferment, which is the result of long-continued investigation and experimen-

tation, and which is free from putrefactive and other ferments found in compressed yeast.

4. Being a product of known elements, subject to known conditions by scientific methods, it is a definite and known product, and is of uniform flavor and composition.

5. It will keep for many months. It may, in fact, almost be said to keep indefinitely.

6. It does not require a tap for its use. The cork of the bottle is withdrawn by an ordinary corkscrew ; then by restoring the cork and shaking the contents and pouring into a glass, the same effervescing beverage is obtained which is represented in the very best specimens of kumyss in which the most fortunate results have been obtained.

Its pure acid flavor unmixed with any nauseating decomposition, is appetizing and refreshing. Its rich, creamy consistency satisfies without cloying. It allays irritation in the stomach, promotes gastric digestion in cases of apepsia, and seems to be more readily assimilated than any other food with which we are acquainted. Manufactured by the Battle Creek Sanitarium Health Food Company, Battle Creek, Mich.

Tuberculin.— A few years ago Professor Koch discovered the remarkable fact that guinea-pigs may be rendered proof against the germs of tuberculosis by repeatedly injecting them first with small then with larger doses of the poison produced by the tubercle bacilli, the germ of consumption. The name *tuberculin* has been given to this poison. It was at first supposed that it would prove effective in the cure of consumption, and certainly a number of persons appeared to be benefited by its use. More mature experience, however, has led to its abandonment, and it is now rarely employed. It is valuable, however, as a means of determining the presence of tubercular disease, and for this purpose it is very largely employed in the examination of dairy cattle. If tuberculosis is present in the animal, an injection of tuberculin produces a very marked rise of temperature within a very few hours.

Diphtheria Antitoxin.— Almost simultaneously the German bacteriologist, Behring, and a French physician, Roux, made the remarkable discovery that the serum of the blood of an animal which had been rendered proof against diphtheria by injection with the poison produced by the diphtheria germ, may be used not only as a means of preventing the disease in human beings and other animals, but also as a means of cure after infection. The theory is that there is produced in the blood of a person or an animal suffering from diphtheria a substance which neutralizes the poison of the disease. Horses are used as a source for the serum. The protection is said to last for five or six months. Many

favorable results from the use of diphtheria antitoxin have been reported, but it must be held that this remedy is still under trial.

A similar remedy has recently been proposed for tubercular disease of the lungs, or consumption. The value of this remedy is still more questionable.

Dermatol.— This, remedy, also known as subgallate of bismuth, is an antiseptic and astringent. It is valuable in the treatment of skin diseases and ulcers, being dusted upon the affected parts. It is also useful as an intestinal antiseptic in doses of five to ten grains after each meal. In cases of hyperpepsia it may be used in the same doses before eating. We have found this remedy valuable, but it does not seem to be possessed of properties equal to charcoal in the form of tablets.

Antiseptic Charcoal Tablets. — Charcoal tablets are not a panacea, but they have proven to be the most valuable remedy we possess for morbid conditions depending upon fermentation or decomposition of food in the stomach and intestines. They consist of a special form of vegetable charcoal, much superior to willow, freshly prepared, to which is added sulphur and subgallate of bismuth, a valuable intestinal antiseptic, and maltose, a valuable peptogen. They render invaluable aid in the treatment of cases presenting the following symptoms of disturbed digestion: Acidity, eructations of gas, heartburn, biliousness, sick headache, nervous headache, bad taste in the mouth, coated tongue, and constipation. Persons suffering from dilatation of the stomach need to make constant use of an intestinal antiseptic of some sort. The antiseptics entering into the composition of charcoal tablets are the only ones with which we are acquainted that may be continually used without injury. Antiseptic Charcoal Tablets are manufactured by the Modern Medicine Company, Battle Creek, Mich.

Antiseptic Charcoal Powder.— The following mixture is a good antiseptic for use when the charcoal tablets cannot be obtained. It has the disadvantage, however, that it is very disagreeable to take: —

℞	Wheat charcoal,*	4 parts.	
	Sulphur,	1 part.	
	Subgallate of bismuth,	½ part.	M.

Mix thoroughly. The dose is a heaping teaspoonful after each meal. In taking, the powder should be placed in a glass, a little water added, sufficient to make a thick paste, then an additional amount of water stirred in so it can be readily swallowed.

*Ordinary willow charcoal is much less effective than the freshly prepared charcoal furnished by the Modern Medicine Co., Battle Creek, Mich.

Antiseptic Lotion for the Stomach.—

℞	Bicarbonate of soda,	3 ozs.	
	Sodium Sulphite,	1 oz.	
	Chloride of sodium,	1 oz.	M.

Add one heaping teaspoonful of this powder to two pints of water. In washing the stomach by means of the stomach-tube, the water employed should be as nearly as possible the temperature of the body.

Antiseptic Dentifrice.—Modern researches have shown that nearly all diseases of the mouth, as well as a large share of the diseases of the stomach, are due to the action of germs which find lodgment there. The mouth is peculiarly exposed to the attacks of germs, as it is located at the very entrance of the body, and a portion, at least, of the respired air passes through it, the germs finding lodgment about the tongue, cheeks, between the teeth, and elsewhere. The mucus secreted by the glands of the mucous membrane lining the mouth, is to some degree antiseptic in character, and possesses germicidal, or germ-destroying, properties to some extent. When the mouth is kept clean, this disinfecting mucus is capable of thoroughly protecting the structures of this portion of the body against the attacks of microbes; but when particles of food are left to lodge between the teeth, the germs, finding abundant soil in which to grow and multiply, become so numerous that the poisonous substances which they produce neutralize the antiseptic mucus so that it becomes powerless for protection.

Meat, of all other articles of food, is most injurious in this manner, for the reason that its fibers readily lodge between the teeth and are not easily removed, and for the further reason that it furnishes a kind of soil in which germs grow with the greatest rapidity and with the most virulent properties.

It is thus apparent that thorough cleanliness of the teeth and mouth is one of the most important hygienic measures. This fact becomes still more apparent when we remember that the act of eating or drinking, and the frequently repeated act of swallowing to clear the throat from mucus, a practice which cannot be too much deprecated, are the means of carrying down into the stomach any microbes which may be present in the mouth. There are certain microbes, also, which seem to have their habitat in the mouth, particularly those of diphtheria, pneumonia, and consumption. It is not known that these germs propagate outside of the human body, except under artificial conditions. They find ready lodgment in the mouth, and are often present there in persons apparently enjoying perfect health, waiting the opportunity when a severe cold or some

other depressing agent shall, by reducing the resistance of the body, enable them to obtain a stronger foothold and to manifest their presence by the characteristic symptoms of diphtheria, pneumonia, or some form of tubercular disease.

The hygiene of the mouth requires thorough cleansing of the teeth and throat before and after each meal. It is well to use some mild antiseptic for the purpose. Cinnamon is one of the best which can be employed for this purpose. Many of the tooth lotions and powders advertised and sold are more or less injurious to the teeth, some are worthless, and a number contain soap and other objectionable substances. The best means of cleansing the teeth with which we are acquainted, is the Antiseptic Dentifrice prepared by the Modern Medicine Company, Battle Creek, Mich. The basis of this preparation is the extract of the bark of the famous soap tree of South America, one of the most remarkable cleansing agents known. The antiseptic properties of the dentifrice are due to the pure cinnamon oil which is added. These substances are combined with very fine precipitated chalk, making a detergent paste which is most effective in its cleansing action. Directions for the use of the dentifrice accompany each package.

Rinsing the mouth thoroughly with simple water, and the vigorous use of the brush, are alone sufficient to render great service in washing away bits of food and masses of growing microbes; but an antiseptic dentifrice is necessary for thorough cleansing. In the absence of anything better, a little cinnamon essence may be added to the water used for cleansing the mouth and throat; a teaspoonful to the glass of water, well mixed, is the proper proportion.

The Perfection Vaporizer.— This instrument consists of a glass bottle, with the interior of which three tubes communicate. One of these is connected with an atomizing bulb, whereby a fine spray or vapor may be produced within the bottle. By the use of suitable solutions, the instrument may be used either with or without the employment of the atomizing bulb, as it is both a volatilizer and a nebulizer. It is the most efficient instrument with which we are acquainted, for the treatment of diseases of the nose, throat, and lungs. It is especially useful in the application of volatile oils and other antiseptic remedies. Diseases of the nose, throat, and lungs are now known to be chiefly due to the development of germs in these regions. By the use of antiseptic remedies, the growth of the germs may be checked, and by the stimulation of the vital activity produced by the remedies, they may in time be destroyed, and thus a cure may be accomplished. The instrument can be used in the treatment of

the nose, the throat, the lungs, and the ears. The following formulæ have been found to be particularly valuable :—

For use without the atomizing bulb, we recommend the following, the first one mentioned (B. C. M. E. W. Solution) being most generally useful:—

B. C. M. E. W. SOLUTION.

℞	Compound Tr. Benzoin,	drms. 6.	
	Oil Cinnamon, Oil Wintergreen, Oil Eucalyptus, Menthol Crystals, each	drm. 1.	
	Alcohol,	drms. 15.	M.

An excellent remedy for acute cold in the nose or throat, also chronic catarrh of the lungs and throat.

B. C. M. E. W. and CREOSOTE SOLUTION.

℞	B. C. M. E. W. Solution,	ozs. 3.	
	Beechwood Creosote, pure,	drms. 3.	M.

Excellent in cases of consumption, and in tonsillitis and bronchial catarrh with fetid breath.

FOR NEBULIZATION, WITH THE ATOMIZING BULB.

The following have been tried in many cases, and have been found very successful :—

M. E. W. C. A. SOLUTION.

℞	Menthol (crystals),	grs. 40.	
	Oil Eucalyptus,	m. 40.	
	Oil Wintergreen,	m. 15.	
	Oil Cinnamon,	m. 10.	
	Alboline (liquid vaseline),	ozs. 4.	M.

Especially useful in cases of chronic nasal catarrh.

BENZOIN and CREOSOTE SOLUTION.

℞	Beechwood Creosote,	drm. 1.	
	Benzoin Solution,	ozs. 4.	M.

Excellent for use in cases of chronic bronchial catarrh and lung consumption accompanied by profuse expectoration.

BENZOIN SOLUTION.

℞	Oil Scotch Pine,	m. 20.	
	Oil Cinnamon,	m. 40.	
	Oil Wintergreen,	m. 20.	
	Oil Eucalyptus,	drm. 1.	
	Menthol Crystals,	grs. 20.	
	Compound Tr. Benzoin,	ozs. 4.	M.

To be used several times daily in cases of bronchial catarrh and asthma.

MENTHOL and CAMPHOR.

℞	Menthol,	grs. 40.	
	Camphor Gum,	grs. 40.	
	Alboline,	ozs. 4.	M.

Very valuable in cases of acute "cold in the head."

Nutritive Enemata.— Life may be maintained by means of the nutritive enema for several weeks, if need be, possibly for a longer time, but it is essential that the proper food should be administered, and that it should be given in sufficient quantity. The popular idea that beef tea or other meat preparations are best suited for this purpose is an error. These substances contain very little real nutritive material, and cannot be relied upon to sustain the vital forces, although they are to some degree stimulative, and on this account produce a deceptive appearance of benefit. If the patient depends wholly upon the nutritive enema for sustenance, food should be given in this way about once in four hours, or five times a day, one feeding being omitted during the night. A copious warm-water enema should be administered twice a day, to remove the unabsorbed food. This enema should be given at least an hour before a feeding, to give opportunity for absorption of any portion of the water which has not been discharged.

In our experience we have found the following preparations best suited to sustain life by rectal feeding : —

1. *Bromose and Egg.*— Dissolve two heaping tablespoonfuls of bromose in two ounces of water. Mix with a beaten egg and a half teaspoonful of salt, and add water sufficient to make eight or ten ounces. Mix well and administer with a suitable syringe, at one feeding. Repeat five times in twenty-four hours, at intervals of four hours. This is the best material for rectal alimentation with which we are acquainted. Bromose may be obtained from the Modern Medicine Co., Battle Creek, Mich.

2. *Egg Enema.*— To two well-beaten eggs add half a teaspoonful of common salt, and water enough to make twelve ounces after thorough mixing. This quantity is sufficient for one feeding. Use five times a day, at intervals of four hours. This preparation is less valuable than the preceding, but may be used in an emergency.

Antiseptic Dressings.— Non-infected wounds, whether surgical or accidental, heal without suppuration when dressed aseptically or antiseptically. Dry sulphur, or a mixture of three parts of dry sulphur with one of subnitrate of bismuth, applied freely to a wound after closing the skin, covered with a dry cheese-cloth or bandage, we have found an excellent antiseptic dressing. Iodoform may also be usefully employed in the same way ; also cheese-cloth saturated with iodoform. Cheese-cloth boiled for half an hour in a 1–2500 solution of corrosive sublimate, or a 1–200 solution of sulphate of copper, is an excellent antiseptic dressing.

Soap-Turpentine Enema.— To a quart of soapsuds, using at least one large heaping tablespoonful of shaved yellow soap, adding a teaspoonful of turpentine. Mix thoroughly and administer at once. This is to be used

in cases in which the ordinary enema and other means employed do not induce efficient evacuation of the bowels.

Saline Laxatives.— A saline laxative may be sometimes usefully employed in thoroughly cleansing the alimentary canal in preparation for a surgical operation, in conjunction with the warm-water enema or the coloclyster. We have found the following formulæ most valuable for this purpose : —

1. *Aqua Salina.*— Sod. sulph., oz. 12 ; mag. sulph., dr. 4 ; sod. chlor., dr. 2 ; aquæ, pt. 8. M.

Dose : One-fourth to two-thirds of a glassful of this solution diluted with a glassful of water, should be taken in the morning, before breakfast. In cases of extreme constipation, an equal quantity may be taken on retiring at night. This remedy is fully as efficacious, as a laxative, as any of the laxative mineral waters, for which it is a perfect substitute.

2. *Seltzer.*— Mag. sulph., 12 parts; acid tartaric, 41.5 parts; sod. bicarb, 46.5 parts. M.

Dose : Two to four heaping teaspoonfuls dissolved in cold water, to be taken before breakfast.

3. *Saline Clyster.*— Sulphate of magnesia, one tablespoonful ; glycerine, one tablespoonful ; boiling water, two tablespoonfuls. M.

The above quantity is the proper amount for a single enema. It is to be used only in cases in which the bowels cannot be induced to move by the ordinary enema. The solution should be introduced by means of a large catheter or rectal tube passed as far into the bowel as possible.

Rectal Irrigator.— This is an instrument devised by the author for the administration of hot water to the rectum. The hot douche is as efficacious in the relief of leucorrhea or catarrh of the rectum, thickening of the rectal mucous membrane, and rectal irritation, as in similar conditions of the vaginal mucous surface for which Dr. Emmett asserts that "it is more valuable than all other local measures combined." (Fig. 9.)

FIG. 9.

The use of hot water for relief of diseased conditions of the rectum has been much less generally adopted than in the treatment of conditions of the vagina and pelvic disorders peculiar to women, probably on account of the lack of a proper instrument for the application of this valuable therapeutic agent to this region of the body. For many years the author employed hot water by means of the continuous enema, and with most excellent results, notwithstanding the

inconvenience of the method, the ordinary enema apparatus being poorly adapted to the required purpose.

Some years ago we devised and constructed the instrument illustrated in the accompanying cut, which we have now used for more than ten years with great satisfaction. The instrument is made of hard rubber, so that it does not readily communicate heat to the skin, which, in this region of the body, is extremely sensitive ; consequently water of a much higher temperature can be used than with a metal instrument.

FIG. 10.

Alternate hot and cold, as well as continuous hot or cold, applications may be made with the instrument by using two fountains, one containing hot and the other cold water, and connecting the two with the irrigator by means of a Y-shaped connecting tube. The instrument may be obtained from the Modern Medicine Company, Battle Creek, Mich.

Instrument for Making Hot or Cold Applications to the Vagina or Rectum.— The accompanying cut illustrates an instrument which the author has devised for making applications of heat or cold to the vagina or rectum. The instrument is furnished in three sizes ; Nos. 1 and 2 are used for the vagina, No. 3 for the rectum. The purpose of the instrument is to avoid the necessity of using a bedpan or other receptacle for conducting away the water in case it is necessary to make the hot or cold applications to these regions of a patient confined to the bed. It is only necessary to introduce the instrument into the rectum or vagina, and connect with A the tube of a fountain douche, and with B a rubber tube by means of which the water can be conducted into a convenient vessel placed by the bedside. By this arrangement applications of any desired temperature, either hot or cold, may be made to the part as long as may be desired, and without inconveniencing the patient by the necessity of retaining a single position, and without danger of wetting the clothing or the bed. In cases in which hot or cold applications are required for the relief of pain, and, in fact, in most cases in which the cleansing effect of water is not required, this instrument gives most satisfactory results. Alternate hot and cold applications can be made by employing two fountains instead of one, and connecting the two with a Y-shaped connecting tube. This instrument, like the above, may be obtained from the Modern Medicine Company, Battle Creek, Mich.

Aseptic and Antiseptic Midwifery.

WITHIN the last thirty years it has been demonstrated beyond all reasonable doubt that a large share of the gravest complications of childbirth are due to germ infection.

The original source of germ infection may be the physician, the midwife, or the patient. It has not infrequently happened that case after case of puerperal fever has occurred in quick succession in the practice of a physician or a midwife, the infection being evidently carried from one patient to another by the medical attendant. It is known, however, that germs which are capable of producing inflammation, blood poisoning, and even death, are constantly found upon and about the external organs of generation; they may even be found in the vagina. It is thus evident that infection may occur, even though the medical attendant be free from infectious germs.

The introduction of aseptic and antiseptic midwifery has resulted in the saving of many thousands of lives and of a vast deal of suffering, as not infrequently the inflammations which follow infection during childbirth give rise to pelvic disorders, which, if not immediately fatal, cripple a woman for life, generally rendering her sterile and a constant sufferer. Not infrequently it has fallen to the lot of the writer to be called upon to perform grave surgical operations for the removal of the Fallopian tubes and ovaries as the only means of relieving a patient who had suffered for half a score of years or more as the result of infection at childbirth.

It has been proven again and again in lying-in hospitals, as well as in private practice, that by sufficiently careful attention to the exclusion of germs it is possible to exclude fevers and inflammatory troubles following childbirth almost altogether; so that in some cases many hundreds of consecutive confinements have been reported without a single death. This great boon to womankind, however, involves the most scrupulous attention to the nicest details.

We have not here space in this short chapter to enter fully into all these, neither is it necessary, since their carrying out would require the

services of a trained nurse. Nevertheless we wish to present a sufficient amount of information to place in the hands of the intelligent expectant mother such knowledge as will enable her to understand what sort of service she may reasonably demand of her obstetric physician and nurse, and to render her capable of intelligently co-operating with her medical attendants in the effort to secure the highest possible degree of safety at the critical period of parturition.

The practice of antiseptic midwifery is based upon the fact that inflammation is due to infection of the blood or tissues by germs. It is a well-known fact that certain precautions may be taken whereby perfect protection against these germs may be secured. These precautions depend upon two things,— cleanliness, and the application of substances capable of destroying germs, known as germicides, or antiseptics.

That the ordinary measures for securing cleanliness,— the application of soap, and the vaginal douche,— are not sufficient, is due to the fact that it is impossible by this means to render the patient absolutely clean. There will always be left some germs which cannot be removed, but which may be destroyed without removal by the employment of the proper measures.

These aseptic and antiseptic measures — in other words, cleanliness and germicides — must be applied to each of the following persons and things: 1. The nurse; 2. The patient; 3. The patient's clothing and bedding; 4. The physician; 5. The child. The substances which may be usefully employed, are —

1. Boiled or Distilled Water.—It is generally not possible to obtain distilled water in sufficient quantity, hence boiled water must be relied upon. Soft water is preferable to hard, for the reason that hard water is likely to destroy or neutralize the chemical substances used for the antiseptic solution. Water must be boiled thirty minutes. After boiling, it should be put into perfectly clean, new jugs, which have been previously boiled and corked up to be ready for use when wanted. It is better that the water should be freshly boiled; it should not, at any rate, be more than two or three days old.

2. Soap.— With the soap use a new nail-brush, or, if a new nail-brush cannot be obtained, the old one should be thoroughly boiled or soaked for twenty-four hours in a strong antiseptic solution; a 1–2500 solution bichloride of mercury is preferable. Ordinary yellow soap is better than toilet soap, and quite as good as any soap called antiseptic soap, since the amount of antiseptic contained in such soaps is not sufficient to be of any special value.

For applying the soap in shampooing the patient a handful of excelsior which has been boiled and made into a nice wad for the purpose, or a freshly boiled "loofah," should be used in preference to an old shampoo brush.

3. **Antiseptic Solutions.**—Of these, the best is corrosive sublimate. For use as a vaginal douche, a solution consisting of one part of bichloride of mercury to 5000 parts of water should be used. For external application, a solution of double strength should be used. It should be remembered, however, that this solution is highly poisonous, and never should be placed in contact with the eyes or mouth of the patient, nor introduced into the rectum; and whenever it is used in the vagina, at the conclusion of the application a quantity of boiled water should be introduced to remove it. For a 1–5000 solution, use three grains to the quart. When ordinary boiled water is used, and not distilled water, it is well to add a teaspoonful of salt to each quart to secure prompt and permanent solution. When solutions of corrosive sublimate are made up in advance, in fact, under all circumstances, it is important to add some coloring matter so that the solution, which is colorless, shall not be mistaken for ordinary water, and thus be inadvertently swallowed, as death may easily result from such an error. The best material to use for coloring is indigo carmine, which makes a deep blue color. Almost any of the blue aniline colors may be used. The red coloring matters should not be used, as they produce a solution having a resemblance to diluted wine or fruit juice. Aniline colors should only be used when the solution is to be employed at once, as they deteriorate the strength of the solution after standing.

Bichloride tablets have been prepared, but these are objectionable, as they resemble lozenges, and hence might be swallowed by mistake. A method devised by the writer which seems to be free from the objections of other methods for providing this very poisonous material in convenient and safe form, consists in preparing small masses of cotton lint, which are impregnated with a mixture of corrosive sublimate and chloride of sodium with the proper amount of coloring matter of such strength that each piece contains three grains of bichloride of mercury, or a sufficient amount to give to one quart of water the strength of a 1–5000 solution of bichloride of mercury. When a 1–2500 solution is required, it is only necessary to add two of these pieces. The material held in a dried form in the cotton is very quickly dissolved by contact with hot water, so that a solution is readily made. The cotton does not interfere with its use for any purpose, so can be left in the vessel or can be re-

moved after a few moments. The ordinary solutions, and some of the powders and tablets prepared by druggists, contain tartaric acid. Such solutions should be avoided, for they are much more likely to produce poisonous effects than a solution made by the addition of chloride of sodium, or common salt, with the bichloride of mercury.

It must never be forgotten that bichloride of mercury is a very powerful poison, and its use in obstetrics is always accompanied by more or less danger, safety depending entirely upon the watchfulness and intelligence of the nurse. It is doubtful, on this account, whether it can ever be safely brought into general use except in hospitals or under circumstances in which it can be used under the immediate supervision of a physician or a trained nurse. In cases in which there is suspicion of disease of the kidneys, and in cases in which there have been extensive lacerations of the vagina or uterus, its use is accompanied by very great risk. It is also sometimes impossible to obtain this drug, hence it is important to know that there are other substances which can very well replace it. One of the very best of these is that which we shall next mention.

Sulphate of Copper.— This substance, commonly known as blue vitriol, is an excellent substitute for bichloride of mercury, or corrosive sublimate. It must, however, be used in much larger proportion. The quantity required for each quart is seventy-five grains, or five drams per gallon. It may be used in the same way as corrosive sublimate, with the exception that it never can be used in connection with soap, with which it forms hard curds which adhere to the skin.

Permanganate of Potash.—This is an excellent germicide, and has the great advantage that it is almost wholly free from poisonous properties. It should be used in the strength of eight grains to the quart. It is preferable to all other substances in cases in which a fetid discharge is present either before or after confinement.

Boric Acid.— This substance has very feeble germicidal properties, but is, nevertheless, of some value, since it prevents the development of germs to a very considerable extent, even though it does not destroy them. It must be used, however, in a very strong solution ; one and one third ounces to the quart is the proper strength.

Preparations for an aseptic and antiseptic confinement ought to begin, if possible, at least a few days before the delivery. Everything about the lying-in room should be put in perfect order, and in the most sanitary condition possible.

Dusty carpets, rags, and drapery should be removed. The dust should be removed with moist or damp cloths, not with a duster. The bed

should be provided with a freshly renovated mattress, freshly washed bed-clothing, and everything should be scrupulously clean. Old feather beds and straw beds must be removed.

Next comes disinfection. The nurse or attendant must, first of all, be sure that she has omitted no precaution necessary to secure absolute personal cleanliness. A thorough bath, clean clothing, and a thorough cleansing of the hands are requisites. More particular instruction upon further details are important.

Disinfection of the Hands.— Clean the nails as thoroughly as possible with a wooden or quill toothpick or some other suitable and not sharp instrument. Scrub the hands and forearms very thoroughly with hot soap suds, using ordinary yellow washing soap and a thoroughly aseptic brush, as indicated above. The water employed should be as hot as can be borne. Use plenty of soap, and give special attention to the nails, which should be cut short preparatory to the scrubbing.

After the hands have been thoroughly cleansed in this way, pour over them a small quantity of saturated solution of borax and carbonate of ammonia, rubbing in the solution well. Dip in boiled water for a second, then immerse in a hot 1–2500 bichloride of mercury solution for two minutes. In the absence of bichloride of mercury, use a permanganate of potash solution, eight grains to the quart. The forearms as well as the hands must be covered with the solution. A permanganate of potash solution will color the skin brown. If the brown color is uniform, it is an indication that the scrubbing has been well done and that all fat has been removed from the skin. If the skin appears mottled, the brown color not being uniform, the scrubbing should be renewed and the disinfection repeated as before. After the delivery is completed and the patient cared for, the brown color of the skin may be easily removed by bathing the hands and arms with a hot solution of oxalic acid.

The physician before examining the patient should cleanse his hands in precisely the same manner, and the nurse should renew the cleansing of the hands whenever they become soiled by contact with infected materials.

Disinfection of the Patient.—The patient should have a thorough soap and water bath a few hours before delivery. This can be administered in bed if necessary. Special attention should be given to the thorough shampooing of the vulva, or external parts, the region about the anus, the groins, the abdomen, and the upper thighs, especially the inside of the thighs. The cleansing of these parts is greatly facilitated by cutting off the hair. Hot, strong soapsuds should be used and a

1-2500 bichloride of mercury solution afterward, or, if corrosive sublimate is not employed, a sulphate of copper solution, five drams to the gallon (seventy-five grains to the quart), may be used. It must be remembered, however, that the parts must be rinsed several times with boiled water so as to remove every particle of soap before the copper solution is applied. It should be applied hot and the parts should be thoroughly scrubbed with it, pains being taken to reach every portion of the surface, leaving nothing secreted behind folds of skin or in the creases of the body.

Before shampooing, the bladder should be emptied, if necessary by the use of a catheter, and the bowels should also be thoroughly evacuated by means of an enema. The enema should be administered with the patient lying on the right side, turned as much as possible upon the face, and with the knees well drawn up. Two or three quarts of warm water should be introduced. It is well to introduce a pint or two of cold water at the end, to stimulate vigorous peristaltic movement, as many women are subject to constipation during pregnancy, and fecal accumulations are very likely to be present on this account, as well as from the pressure of the enlarged uterus. Be sure that the water employed for the enema is thoroughly evacuated, and the parts very carefully cleansed afterward.

After thoroughly cleansing the external parts, a disinfecting douche should be administered. This may consist of a bichloride of mercury solution, one part to five or ten thousand, or half a grain to three grains to a quart of water, or the copper solution may be used. The copper solution is quite astringent, however, and should be employed only in cases in which it is known that the patient is suffering from disease of the kidneys or is especially susceptible to the influence of mercury. Before the disinfecting douche is administered, the vagina should be thoroughly washed out with a hot soap and water douche. Strong soap suds is made with three or four quarts of water, employing yellow soap. Pains must be taken to turn the douche tube in various directions, and, if necessary, to wash the vagina out by using one or two fingers, as there is very frequently a considerable amount of accumulated mucus hidden in the folds of the relaxed vagina, which will not be reached otherwise. Employ the antiseptic douche, which should consist of not less than two quarts of water, and should be at least 105° in temperature,—and in most cases 110° to 112° F.

The only precaution necessary in the use of the douche is to avoid the employment of too much force. A high degree of force might

stimulate uterine contractions prematurely. This precaution is, of course, not necessary when the douche is used after the beginning of labor, and may even prove useful in stimulating the uterus to activity when the labor pains are not sufficiently vigorous. To avoid employing too much force, it is only necessary to take care to place the fountain (the syphon or fountain syringe should always be used in preference to any other, in these cases) at a distance not to exceed a foot and a half to two feet above the patient. To ensure safety in this respect, it is well to insist upon the use of a rubber conducting tube of not more than two feet in length. If the labor is prolonged, the antiseptic douche should be repeated at least once in four hours until delivery takes place.

Carbolic acid may be used in the proportion of four drams to the quart, or one part in sixty, as a substitute for a sulphate of copper or corrosive sublimate solution, when necessary to do so.

During labor the vulva should often be bathed in an antiseptic solution, employing either the bichloride or the copper solution. After delivery, administer first a douche of hot boiled water to remove fragments, to stimulate uterine contraction, and then a solution of permanganate of potash or sulphate of copper. Both the copper and the permanganate of potash solutions are quite astringent, and hence are useful to some extent in correcting the relaxed condition of the vagina, which is always present after labor.

In administering the vaginal douche after labor, it is especially important to remember that there is danger of introducing the fluid into the uterus. This danger will be obviated, however, by taking the precaution to employ the fountain syringe only and to place the fountain not more than one foot above the patient, or just high enough to cause the water to flow through the tube. Administered in this way, the douche is devoid of danger, and is a great aid to comfort and cleanliness.

The permanganate of potash solution is especially useful in cases in which the patient has, before confinement, suffered from an irritating or offensive leucorrheal discharge. In such cases the lochial discharge is likely to become irritating and offensive also, hence requiring the disinfectant and deodorant properties of the permanganate solution. In case the discharge is slightly bloody in appearance, the sulphate of copper solution is especially valuable on account of its astringent properties This is especially true when the bloody discharge is bright red in color, indicating a bleeding surface at the neck of the womb, from laceration.

A large sheet of rubber placed under the patient is an important aid to asepsis after delivery. Three or four dozen antiseptic cotton

pads are also useful. These should be prepared in advance, placed in a cotton bag, and boiled for half an hour in a 1–2500 solution of bichloride of mercury or a 5–1000 solution (five drams to the gallon) of sulphate of copper. These pads should be about half a yard long and

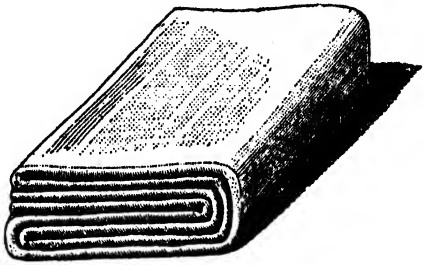


Fig. 11.

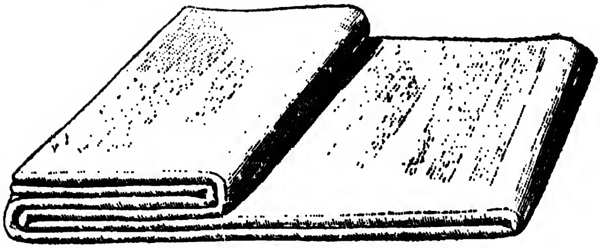


Fig. 12.

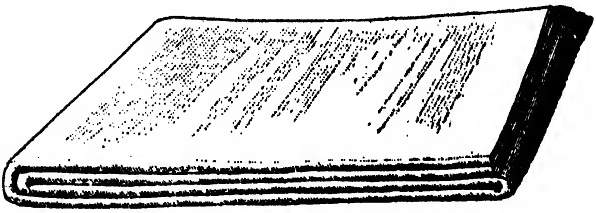


Fig. 13.

TARNIER'S DRAW-SHEET.

five inches wide when folded. They should be of different thicknesses. Those to be employed for the first days should be quite large and thick. After the first two or three days, smaller ones may be used. They are placed under the patient in such a manner as to receive the discharges, being changed as often as soiled, and afterward burned.

Tarnier's draw-sheet is a very convenient device; it is shown in the accompanying cuts. It consists of a large cloth folded in such a way

as to give the appearance shown in Fig. 1. This is placed under the patient during labor. It raises the hips and facilitates examination, and thus is a decided aid to the physician in his examinations and in the delivery of the child. At the beginning of delivery the first fold is brought down, as shown in Fig. 2. After delivery, while the patient is being cleansed, the second fold is brought down, giving the pad the shape shown in Fig. 3. By this means the highest degree of cleanliness is secured in the most convenient manner possible. This device is very popular in France, but has not yet been very extensively introduced into this country.

A few words must be said respecting the antiseptic treatment of the nipples. If sore, the nipples should be treated twice daily with a hot 1-5000 solution of bichloride of mercury, or a saturated solution of boracic acid, and dusted with subnitrate of bismuth or zinc oxide.

Intestinal Antisepsis.—Still another measure of great importance in securing immunity from unfortunate complications during childbirth, is intestinal antisepsis. This requires careful attention to the patient's condition and regimen for at least a number of days prior to confinement. A matter of the first importance in intestinal antisepsis is the dietary. This will exclude all such articles as meat, cheese, fish, oysters, pastry, pickles, coarse vegetables, and everything of an unwholesome or indigestible nature. The only flesh food at all allowable is a small amount of the white flesh of fowl. It is best to omit even this for at least a few days prior to the confinement. The most suitable articles of food are fruits of all kinds, grains simply prepared, ripe fruit of all sorts, either fresh or simply cooked, grains of all kinds, prepared in a simple and wholesome manner, purées of pease, beans, and other legumes, vegetable broths, eggs, buttermilk, kumyss, cottage cheese, bread of all kinds, granola, granose, gluten preparations, and other of the excellent health foods produced by the Sanitarium Health Food Company, Battle Creek, Mich. Granose is especially to be recommended for cases of this sort, on account of its value in the cure of constipation, and in the relief of dyspeptic symptoms. It is also a very delicious and palatable article of food. It may be used with advantage during the entire period of pregnancy.

Water should be taken freely in quantities of from two to four pints daily. Tea and coffee must be carefully avoided. Ordinary butter is also unwholesome. Beer and all kinds of alcoholic liquors are exceedingly detrimental. Cases in which the tongue is coated and in which there is a tendency to flatulence, acid stomach, diarrhea, biliousness, sick

headache, or in which similar conditions exist, charcoal may be advantageously taken after each meal as an intestinal disinfectant. The antiseptic charcoal tablets made from the author's formula by the Modern Medicine Company, of Battle Creek, Mich., have proven to be especially valuable in these cases, particularly as a means of combating constipation and biliousness. In cases in which the stomach is very much disordered, lavage or stomach washing by means of the stomach-tube may be advantageously practiced.

The importance of intestinal antisepsis in these cases was very forcibly impressed upon the writer by a case seen in consultation a number of years ago, in which the patient died of sepsis a week after confinement, but without giving any symptom whatever of inflammation or sepsis in connection with the uterus or pelvic viscera. The sepsis was evidently due to a hearty meat dinner. Enemas which were administered brought away large quantities of extremely purulent material. The patient, an unusually strong and vigorous woman, thinking herself beyond any danger of injury, transgressed the strict dietetic orders given her by her physician, and died in consequence. The suggestions respecting intestinal antisepsis should be carefully followed for at least a few weeks prior to confinement and for two or three weeks afterward. It is, in fact, far better that the same measures should be continued during the entire pregnancy and nursing period, and women who wish to attain the highest standard of health and vigor at all times, will find it advantageous to adopt, as their habitual diet, the simple antiseptic dietary described.

A word should be said with reference to the application of antiseptics to the care of the infant. This relates especially to the care of the cord. The cord having been properly tied, is thoroughly cleansed, first with soap and water, and then with an antiseptic solution, the bichloride solution, 1-10,000, or the sulphate of copper solution, 1-5000, being employed for the purpose. The solution should be as hot as can be applied safely. After drying, without rinsing off the antiseptic solution, absorbent cotton, which has previously been boiled in a 1-10,000 solution of corrosive sublimate or 1-5000 solution of sulphate of copper, and afterward carefully dried, is applied about the cord in such a manner as to thoroughly protect it. A good method of making the application is to make an opening through the center of a properly prepared layer of antiseptic cotton, large enough to lay over the cord. Slip this over the cord, then fold up the edges around the cord, lay flat upon the abdomen, and cover with a proper bandage. When treated in this manner, the stump of the cord will usually separate in four or five days, and the resulting raw surface

will quickly heal. The old method of treatment often involved an ugly suppurating ulcer, which was not infrequently very troublesome to heal.

Many women, especially women of feeble muscular development, and hence most women in civilized countries who are not accustomed to active muscular pursuits, suffer, after confinement, from a relaxed condition of

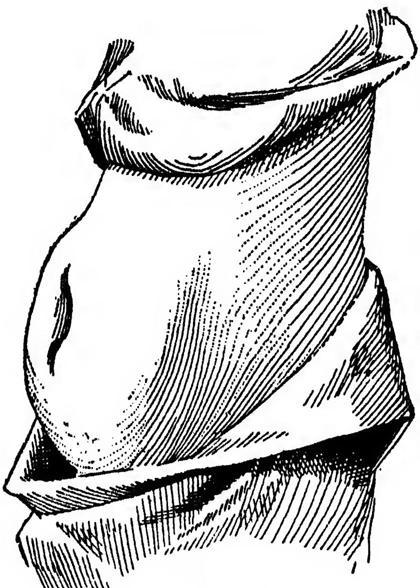
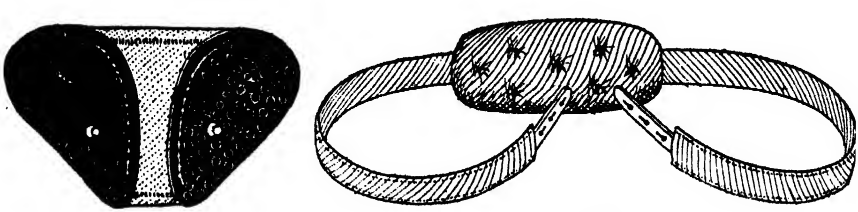


Fig. 14.

Fig. 15.



A B

Fig. 16.

the abdominal muscles, and in consequence, prolapse of the bowels, stomach, and often liver and kidneys. A great variety of nervous troubles and other disorders, such as constipation, indigestion, headache, and still more serious maladies, as Bright's disease and consumption, are the outgrowth of this prolapse of the viscera. Backache, from which so many women complain, is more commonly due to this cause than to any de-

rangement of the pelvic organs, although displacements of the womb and ovaries and inflammation of these organs are very likely to follow displacement of the abdominal viscera.

As a precaution against this unfortunate consequence of the long-continued stretching of the abdominal muscles during pregnancy, and the inability of the undeveloped muscles to at once contract after childbirth so as to properly support the internal organs, it is important that artificial means should be employed for a time after confinement, to support the abdominal contents in place. Various abdominal supporters have been recommended for this purpose, but few have been found satisfactory. Supporters which are applied to the whole abdominal wall are unsatisfactory for the reason that the lower anterior portion of the abdomen is the only point where the support is really required.

The Natural Abdominal Supporter.— This instrument, well shown in the accompanying cuts, has been devised for the purpose of supporting the contents of the abdomen, when prolapsed, by a means as nearly natural as possible. It is a very common thing for these patients to remark, "When I am on my feet, I feel that I must hold myself up with my hands," at the same moment placing the hands across the lower abdomen and making pressure upward. Taking a hint from this, we have prepared the supporter which is herewith shown, and which consists of two hard rubber pieces connected by an elastic webbing, which rest against the lower abdomen, being carefully shaped so as to make a uniform pressure ; and second, a set of steel springs attached to a back piece and so adjusted as to make pressure upon the hard rubber plates simultaneously backward and upward. The action of the supporter is almost a perfect imitation of the hands in lifting the prolapsed abdominal contents. After trying every form of supporter obtainable, we have found the Natural Abdominal Supporter more satisfactory than any other, and have employed it in a very large number of cases. It is manufactured and sold by the Modern Medicine Company, Battle Creek, Mich.

The measures outlined in this chapter are presented in addition to the directions elsewhere given in this volume for the proper care of the lying-in woman.

EXERCISE, ACTIVE AND PASSIVE.

Considerable attention is given in the body of this work to the subject of exercise as a means of cure, particularly to the employment of manual Swedish movements, or medical Swedish gymnastics. A few additional suggestions may, however, be of value, especially with reference to the adaptation of exercise as a remedial measure to different forms of disease and to different conditions. Our limited space gives us opportunity for but a few brief hints.

Exercise for Children.— Children and young persons possess great aptitude for acquiring new exercises requiring a great degree of skill and dexterity, but have little endurance; their soft, bony structures and imperfectly developed muscles and tendons render prolonged exercises of the same sort injurious and likely to produce deformities. On this account, various exercises which will secure an all-round development, with careful avoidance of violent exercises and the continuance of exercise of the same sort for too long a time, are matters of great importance. Children's games, bicycle riding, and swimming are especially to be commended as excellent exercises for children, remembering always the precautions mentioned. Every child should learn to swim. Special attention should be given to the development of lung power and to the cultivation of a good physique and correct carriage of the body in walking and sitting.

Exercise for Girls.— Below the age of puberty, girls possess the same aptitudes in physical abilities as boys. In fact, from the ages of twelve to fourteen years, girls are somewhat ahead of boys in development, the average girl being actually taller and better developed than the average boy of that age, both physically and mentally. After puberty, however, the special development in girls must be considered in their exercises. The endurance of young women is less adapted to exercises which require the support of the body by the arms than are men, for the reason that their arms are much weaker in proportion to their body, as compared with boys, than are the legs or the muscles of other parts of the body. It is especially important that exercise for young women who have not been brought up to vigorous muscular pursuits, should be carefully regulated, as the weakness of internal structures in undeveloped young women

is likely to lead to serious displacements as the result of engaging in vigorous muscular exercise requiring a straining effort. It is only by a long and carefully conducted course of training that such young women can be developed to a condition in which vigorous gymnasium exercises can be engaged in without injury.

Exercise for Adults.— The average healthy adult man can engage without injury in muscular exercises of all sorts, and may exercise as vigorously as he feels disposed to, within reasonable limits, of course, short of great exhaustion. No injury results from becoming tired, or even exhausted, to a moderate extent. Nature's sweet restorer, sleep, and sufficient rest will not only restore the tired or exhausted individual, but make him stronger than before, unless, of course, the exhaustion has been extreme in degree. Invalid adults must have such specific directions respecting exercise as are particularly applicable to their individual cases.

Exercise for Aged Persons.— In old age both the aptitude for exercise and the ability to execute muscular movements are to a very considerable degree diminished. The capacity and activity of heart and lungs are lessened, also the ability to recuperate from exhaustion. There is, moreover, a marked tendency to consecutive or secondary fatigue, a form of exhaustion which is not experienced at the time of exercise, but is felt to a marked degree a day or two subsequently. An old person feels the fatigue of an effort less at the time than twenty-four or forty-eight hours later ; consequently he is likely to go beyond the proper limit in the expenditure of muscular energy before he is aware of the fact that he has done so. Elderly persons should always bear this in mind when engaging in physical exercise, especially those who have not all their lives been accustomed to active muscular pursuits.

Exercise for Obese Persons.— Very fleshy persons need all the exercise they can take, and more. Exercise is necessary to burn up the surplus fat. Exercise, in fact, affords the only means by which permanent relief from obesity can be obtained. It must be remembered, however, that the exercise must be taken daily and systematically, and must be made a regular habit of life and continued so long as the tendency to accumulate flesh continues. In case of extreme obesity, the exercise at first taken must be very gentle, and must be gradually increased as the patient's strength increases and as the amount of adipose tissue diminishes. Walking, wood chopping, Swedish gymnastics, bicycle riding, in cases in which obesity is not too great, carefully graduated mountain climbing, the tread-mill, gymnasium exercises of various sorts, and rowing are all important and valuable means of exercise for obese persons.

Exercise must be carried to the extent of fatigue to be of benefit in reducing flesh. Exercise before breakfast is more effective than at any other time of the day.

Exercise for Dyspeptics.— In dyspepsia, exercise must be regulated according to the strength, the age, the sex of the individual, and the form of indigestion present. Before undertaking a course of exercise, it is important to recall the fact that in quite a large proportion of dyspeptics there is displacement of the stomach or colon, or both of these organs, and perhaps other of the abdominal viscera, and it is important both for comfort and as a measure to insure success in the employment of exercise, that these organs should be restored to their normal position and supported in place by a properly adjusted abdominal supporter (see page 1608) before the exercise is undertaken; otherwise injury rather than good may result. Many dyspeptics complain of coldness of the hands and feet, and observe that exercise tends to increase this unpleasant symptom. The reason is the pendant condition of the abdominal viscera, causing a strain upon the sympathetic nerve and a disturbance of the vasomotor system, whereby there is a contraction of the blood-vessels of the extremities. The Natural Abdominal Supporter, properly adjusted, prevents this inconvenience.

The dyspeptic who has small digestive capacity must, of course, avoid expending too much energy in muscular work, as he may be weakened thereby instead of strengthened; hence he should keep a careful watch of his bodily weight while taking exercise, and if there is a marked diminution in weight, he should lessen the amount of exercise accordingly. In some instances it is necessary to begin, as with other classes of feeble invalids, with a course of rest-cure for two or four weeks, whereby a store of tissue is laid up in the form of fat and blood to be drawn upon as a means of supporting the muscular work to be subsequently undertaken.

Breathing exercises are especially valuable for dyspeptics. We have dwelt upon this subject at greater length in another work especially devoted to the disorders of digestion, entitled, "The Stomach: Its Disorders and How to Cure Them," published by the Modern Medicine Publishing Company, Battle Creek, Mich.

Walking, horseback riding, bicycle riding, and especially the different forms of Swedish gymnastics, manual and mechanical, are of great value in the different forms of indigestion. Exercises involving the trunk are especially helpful in the majority of cases. The following suggestions with reference to the application of exercise to different classes of dyspeptics, will be found helpful:—

1. Hyperpeptics must avoid vigorous exercise of any sort soon after eating, for the reason that such exercise has the effect to increase the secretion of gastric juice, which is already excessive in this class of patients.

2. Hypopeptics may exercise with moderate vigor after eating, with advantage, as increase of secretion is required in these cases. The same is true of patients suffering from apepsia.

3. In simple dyspepsia, moderate exercise is allowable after eating, and is especially advantageous in those cases in which there is a tendency to drowsiness after eating. This should be resolutely combated, as the habit of sleeping immediately after eating is highly injurious. The drowsiness is generally easily dispelled by vigorous breathing movements or gentle exercise.

4. In ulcer of the stomach, absolute rest is usually necessary.

5. In cases in which there in much soreness in the abdominal region, and especially in cases in which there is a dragging sensation in the lower abdomen or in the back, also in most cases in which spinal irritation exists, only very moderate exercise should be taken until these symptoms disappear, unless the symptom can at once be relieved by the application of the Natural Abdominal Supporter, which is generally the case. (See page 1608.)

6. The best time for exercise for most dyspeptics is about two or three hours after eating. Exercise before breakfast is advantageous only in case of robust and very fleshy persons.

Exercise in Diabetes.— Exercise is one of the most important means by which the surplus sugar in the blood of a diabetic patient may be disposed of. It is the best of all means for stimulating vital combustion. Next to regulation of the diet, it is the most important of all means in the treatment of diabetes. It is important, however, that the exercises should be carefully regulated. In cases of diabetics in which there is loss of appetite and great weakness, rest in bed, instead of exercise, is the proper measure. Exercise should always be avoided in cases of diabetics in which there is a rapid loss of flesh. It is especially indicated in cases of diabetes accompanied by obesity,— a not uncommon combination,— or in which there is a good appetite, a considerable degree of vigor, and no material loss of flesh. In such cases exercise should be carried to the extent of fatigue, as otherwise it is of little value. All kinds of exercise are beneficial, at least such as are adapted to the age and general strength of the patient; but difficult exercises are of greater value than others, for the reason that they are more effective in inducing fatigue.

Exercise for Rheumatism.— The rheumatic patient most of all, finds difficulty in taking exercise, for often even the slightest movement causes pain, and hence exercise seems to be counterindicated, whereas, in the majority of chronic cases, it is the only means by which a cure can be effected. Exercise must, of course, be prohibited in all rheumatic conditions in which there is inflammation, as indicated by heat, swelling, or great tenderness of the affected joints, and by a general rise of temperature. Under such conditions, rest with derivative massage, and at most very gentle exercise, are indicated. For persons suffering from chronic rheumatism or the rheumatic diatheses, exercise is, however, next to an antiseptic and non-flesh diet, the most important of all measures of treatment. Exercise must at first be gentle, and stop short of great fatigue or severe pain. Rheumatics are very subject to secondary fatigue, especially those who are advanced in life. This fact must be borne in mind when determining the amount of exercise which can be discreetly taken. Manual and mechanical Swedish movements are especially adapted to this class of patients, particularly at the beginning of a course of treatment. Walking, rowing, bicycle riding, and all forms of active exercise are useful.

Exercise for Consumptives.— In consumption, exercise affords one of the most important of all measures leading toward recovery. It must be constantly borne in mind, however, that exercise may be damaging as well as helpful in consumption, as in many other maladies. All consumptives are subject to exacerbations of their disease, in which there is a marked rise of temperature and great weakness and prostration. Under such conditions, rest in bed or in a reclining position is a measure which is imperatively demanded. Even gentle exercise will often greatly increase the rise of temperature under such conditions. A patient in such a state needs rest as much as does the patient suffering from typhoid or any other infective fever. Attacks of this sort usually last but a short time, — from one to six weeks,— after which time the temperature sinks to a lower level, the thermometer generally showing a sub-normal temperature in the morning and a rise of one to three degrees at night. When this condition is found, and in the interim between the attacks referred to, exercise should be taken daily, being carefully graduated to the patient's strength. All violent exercises must be avoided. Anything which causes a very considerable degree of pulmonary congestion, as indicated by violent coughing, must also be avoided, as such exercises tend to bring on pneumonic attacks and thus encourage the extension of the disease in the lungs. Special attention must be given to respiratory exercises. Pneumatic apparatus of various sorts, and the author's Ex-

halation Tube (see page 721), are efficient means of lung development. Carefully graduated mountain climbing is one of the best of all means of exercise for consumptives.

Consumptives who visit an elevated region for climatic advantages, must rest for some days, and in the majority of cases for a few weeks, before beginning exercise. The purpose of this is to give the lungs an opportunity to expand and the respiratory muscles to acquire development so as to give the increased breathing capacity necessary for exercise in a rare atmosphere. Many invalids have brought upon themselves severe attacks of pneumonia, with a great aggravation of their maladies, and thus sacrificed their chances for life, by neglecting this precaution.

Exercise for Women.— In addition to what has been said above with reference to exercise for girls, which applies, of course, also to women, we wish to call attention to the fact that nearly all civilized women are suffering from weakness of the muscles of the trunk as the result of a mode of dress which prevents proper development and exercise of the muscles of this region of the body ; hence special attention should be given to the development of these muscles as the surest means of securing permanent recovery from many of the maladies to which women are especially subject. In the great majority of cases, the backache from which women suffer is due not to displacement of the pelvic organs, but to strain upon the abdominal sympathetic nerves resulting from general displacement of all the abdominal viscera. The author has shown by extensive researches, the results of which have been published at various times in medical papers, that displacement of the organs of the pelvis is almost invariably accompanied by displacement of the stomach, bowels, or other organs. This condition is not to be remedied by the employment of pessaries to support the uterus, or by operations upon this or other pelvic organs, but requires the replacement and support of all the abdominal viscera. Replacement of the viscera must be accomplished by massage. The method of doing this is minutely described in the work by the author devoted to the subject (" The Art of Massage," Modern Medicine Pub. Co., Battle Creek, Mich.). The organs must be daily replaced by a person skilled in this procedure, and must be held in place by an abdominal supporter capable of accomplishing this purpose without interfering with the action of the abdominal muscles or any other muscles of the trunk. The ordinary abdominal bandage interferes with muscular movement by constriction of the body, and hence defeats the purpose for which it is applied. In addition to these mechanical means of relief, it is necessary, also, to employ such exercises as will secure a proper development of the abdominal muscles. Swedish gymnastics, bicycle riding, rowing, and special ex-

Fig. 1.—Vibrating Chair.

Fig. 2.—Vibrating Platform.

Fig. 3.—Endwise and Lateral Vibration of the Feet and Legs.

Fig. 4.—Rotary Vibration of the Legs and Arms.

PLATE XXIII.

Fig. 5 Vibrating Bar.

Fig. 6. Apparatus for Mechanical Percussion.

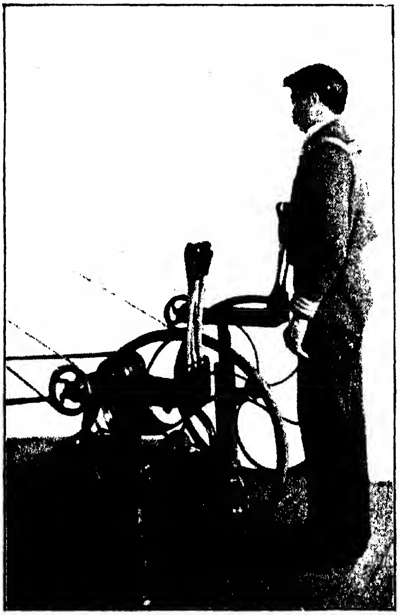


Fig. 7.—Beating Apparatus.

Fig. 8.—Trunk Rolling.

PLATE XXIV.

ercises which bring into action the muscles of the trunk, particularly those which form the abdominal walls, are of special value.

Massage.— This is one of the most valuable of all remedial measures. As a means of securing tissue rebuilding, improvement in nutrition, and building up of the blood and tissues in general, there is nothing superior. When used in combination with water and electricity, it often accomplishes the most amazing results. But it is important that it should be employed in a thoroughly scientific manner in order that the best results may be attained. The principal procedures in massage are touch, stroking, friction, vibration, percussion, kneading, and joint movements. We have not space to describe here in detail these several procedures, having entered into this subject at length in another work ("The Art of Massage," Modern Medicine Pub. Co., Battle Creek, Mich.), in which every detail of the art is accurately described and fully illustrated.

Mechanical Massage.— So little is known upon this subject that we may be pardoned for dwelling upon it more at length than we otherwise should do, the writer having given special attention to the development of this branch of mechanico-therapy during the last twenty years. The following paragraphs with illustrations (Plates XXIII, XXIV, XXV, and XXVI) are extracts from the author's work on massage above referred to:—

The Vibrating Chair.— Figs. 1 and 2 represent a vibrating chair which I devised in 1883, and have since had in constant use at the Battle Creek Sanitarium. The usual rate of vibration which I employ is twenty per second. A person needs to experience but a single application to become convinced of the powerful physiological effects which may be produced by mechanical vibration.

The Vibrating Platform. — In standing erect upon the moving platform on which the chair rests, the muscles of the legs are brought into powerful action. Not only the muscles of the lower leg, but the muscles of the thigh, are thrown into tetanic contraction by the strong vibratory movements transmitted through the legs (Fig. 2). The application usually lasts about five minutes. A separate platform may also be used.

Vibration of the Arms and Legs.— The legs are vibrated in three ways: (1) By means of an endwise movement; (2) by means of a lateral movement; (3) by means of a rotary movement. See Figs. 3 and 4.

The Vibrating Bar.— Fig. 5 is a very imperfect representation of an apparatus I had constructed several years ago, in which a suitable mechanism drives a pair of horizontal bars at a high rate of speed.

Mechanical Percussion.— There are two forms of percussion which may be administered mechanically; viz., (1) slapping; (2) beating. Fig. 6.

Mechanical beating (Fig. 7) is an efficient mode of percussion, though less valuable than beating administered by the hand.

Trunk Rolling.— The apparatus represented in use in Fig. 8 consists of a pair of pulleys moving in alternation and in opposite directions, a fraction of a revolution in each direction. To each pulley is attached one end of a broad strap, which is passed around the trunk in such a manner that, as the strap is pulled first in one direction and then in the opposite, the tissues are acted upon very much as in certain forms of palm kneading.

Trunk-exercising Apparatus.— Figs. 9 and 10 represent forms of apparatus which are of substantial service in exercising the trunk muscles.

Tilting Table.— In Fig. 11 is represented a tilting-table, which the writer devised nearly twelve years ago, and has had in use since. The patient lies upon his back while one end of the table top is lifted by means of a large cam operating beneath it. The patient lies with his head at the stationary end of the table.

Pelvis Tilting.— Nearly all forms of pelvic disease give indication for the use of the tilting-table above described. In displacement of the womb or ovaries, however, as well as of the stomach, liver, kidneys, bowels, and other abdominal organs, it is important to combine with the vasomotor gymnastics described, the employment of position as an aid to restoration of the displaced viscera. This is accomplished by adding to the tilting-table a device by means of which the pelvis is lifted free from the table while the patient lies upon the face, thus causing the abdominal wall to sag downward (Fig. 12).

Mechanical Respiration.— In Fig. 13 is shown an apparatus by means of which artificial respiration may be mechanically administered.

Cannon-ball Massage.— A cannon ball (Fig. 14) covered with leather is a valuable mechanical accessory in the application of abdominal massage. The ball is simply rolled upon the abdomen, following the course of the colon from right to left.

The Shot-bag.— This is simply a bag containing a quantity of fine shot. The weight should be three or four pounds. It is used in a manner similar to the cannon-ball, being slowly rolled along the colon from right to left.

Nerve Percutor, or Vibrator.— This instrument, which I have recently had constructed, and to which reference has previously been made, consists of a metallic chamber in which a mass of soft iron is made to play to and fro with considerable force by means of an alternating electrical current passing through a coil of wire which constitutes a part of the chamber. Fig. 15.

Fig. 9. Revolving Seat.

Fig. 10. Tilting Seat.

Fig. 11.—Tilting Table.

Fig. 12.—Pelvis Tilting.

PLATE XXV.

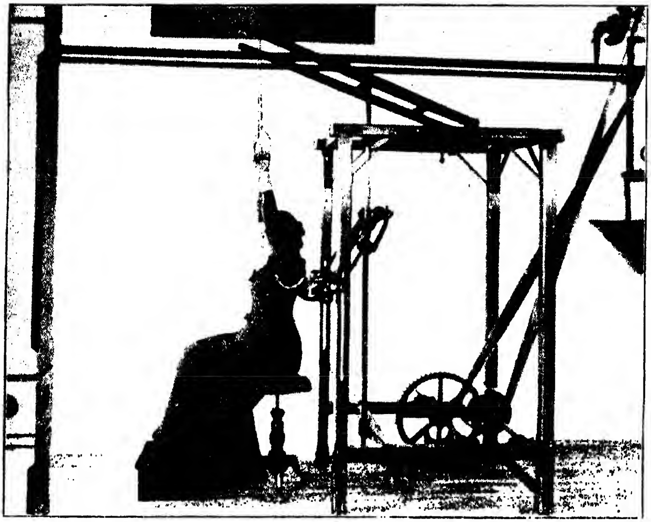


FIG. 13. APPARATUS FOR ARTIFICAL RESPIRATION.

FIG. 14.—CANNON-BALL MASSAGE.

FIG. 15.—NERVE PERCUTER.

PLATE XXVI.

NEW METHODS FOR THE STUDY OF DISORDERS OF DIGESTION.

THE SCIENTIFIC INVESTIGATION OF DIGESTIVE DISORDERS.

THE determination of the nature of the disorders of digestion is no longer a matter of guess-work. Modern medical science has placed in the hands of the skilled physician, methods whereby he can determine with accuracy the exact nature of any deviation which the process of stomach digestion may undergo as the result of disease. This method requires that the patient shall take a test-meal, which usually consists of two ounces of bread and eight ounces of water. At the end of an hour, the contents of the stomach are removed by the aid of a flexible tube, one end of which is passed into the stomach of the patient. This operation is by no means so distressing or difficult as might appear. The tube, being very small, soft, and flexible, is easily introduced into the stomach by causing the patient to take one end of it in his mouth and make the movements of swallowing, whereby it is easily carried into the stomach. After obtaining the stomach fluid in this manner, it is carefully filtered and subjected to most minute scrutiny, whereby the exact nature, quantity, and quality of work done in the stomach is determined. On the following page will be found a fac-simile of the blank upon which is recorded the results of the analysis of each stomach fluid, each one of the particulars called for being determined with the same careful precision as is observed in the analysis of ore or any other class of exact chemical work. By the employment of this careful method in the analysis of more than 5000 stomach fluids, we have been enabled to make the following classifications, which include all possible forms of disturbance of the process of peptic digestion. In the method employed, the writer has availed himself of the various methods which have been devised by Hayem and Winter, Ewald, and other investigators, and such others as the wide opportunity afforded him for a study of this class of disorders, has enabled him to devise and utilize.

GRAPHIC REPRESENTATION

Of the Results of Examination of Salivary and Gastric Digestion. Based upon the Study of over 5,000 Cases in the Physiological Laboratory of the Battle Creek (Mich.) Sanitarium.

Case of ....

ARRANGED BY
J. H. KELLOGG, M. D.

A′	H	C	A	S	COEFFICIENTS OF DIGESTIVE WORK.					
	Free HCl.	Combined Chlorine.	Total Acidity.	Starch Digestion.	Fermentation.		Starch Digestion.	Salivary Activity.	Solution.	Absorption.
					a	x	b	c	y	z
.430	.240	.410	.480	7.00	6.00	100	2.00	10.00	2.00	6.00
.410	.225	.390	.440	6.50	5.00	90	1.90	9.00	1.90	5.00
.390	.210	.370	.410	6.25	4.50	80	1.80	8.00	1.80	4.00
.370	.195	.350	.385	6.00	4.00	70	1.70	7.50	1.70	3.00
.350	.180	.330	.360	5.75	3.50	65	1.65	7.00	1.65	2.50
.335	.165	.315	.340	5.50	3.00	60	1.60	6.50	1.60	2.25
.320	.150	.300	.320	5.25	2.75	55	1.55	6.00	1.55	2.00
.305	.135	.285	.305	5.00	2.50	50	1.50	5.50	1.50	1.75
.290	.120	.270	.290	4.75	2.25	45	1.45	5.00	1.45	1.50
.275	.110	.255	.275	4.50	2.00	40	1.40	4.50	1.40	1.40
.260	.100	.240	.260	4.25	1.75	35	1.35	4.00	1.35	1.35
.245	.090	.225	.245	4.00	1.50	30	1.30	3.50	1.30	1.30
.230	.080	.210	.230	3.75	1.40	25	1.25	3.00	1.25	1.25
.220	.070	.200	.220	3.50	1.30	20	1.20	2.50	1.20	1.20
.210	.060	.190	.210	3.25	1.20	15	1.15	2.00	1.15	1.15
.200	.050	.180	.200	3.00	1.10	10	1.10	1.50	1.10	1.10
.195	.044	.174	.195	2.75	1.05	5	1.05	1.25	1.05	1.05
.190	.038	.168	.190	2.50	1.00	[illegible]	1.00	1.00	1.00	1.00
.185	.031	.161	.185	2.25	.95		.95	.90	.95	.95
.180	.025	.155	.180	2.00	.90		.90	.80	.90	.90
.170	.024	.145	.170	1.80	.85		.85	.70	.85	.85
.160	.023	.135	.160	1.60	.80		.80	.60	.80	.80
.150	.022	.125	.150	1.40	.75		.75	.50	.75	.75
.140	.021	.115	.140	1.20	.70		.70	.40	.70	.70
.130	.020	.105	.130	1.00	.65		.65	.30	.65	.65
.120	.018	.095	.120	.90	.60		.60	.25	.60	.60
.110	.016	.085	.110	.80	.55		.55	.20	.55	.55
.100	.014	.075	.100	.70	.50		.50	.15	.50	.50
.085	.012	.065	.085	.60	.45		.45	.12	.45	.45
.070	.010	.055	.070	.50	.40		.40	.10	.40	.40
.055	.008	.045	.055	.40	.35		.35	.08	.35	.35
.040	.006	.035	.040	.30	.30		.30	.06	.30	.30
.025	.004	.025	.025	.20	.20		.20	.04	.20	.20
.010	.002	.010	.010	.10	.10		.10	.02	.10	.10
.000	.000	.000	.000	.00	.00		.00	.00	.00	.00
					a		b	c	y	z

HYPERPEPSIA.

SIMPLE DYSPEPSIA.

HYPOPEPSIA.

APEPSIA.

Inferior Quality of Proteid Digestive Products.

WELL DISINTEGRATED.

RAPID ABSORPTION.

IMPERFECTLY DISINTEGRATED.

SLOW ABSORPTION.

CLASSIFICATION OF FUNCTIONAL DISORDERS OF THE STOMACH.

The symbols under each head indicate the characteristics of each individual form of quantitative disturbance to which the stomach is subject.

HYPERPEPSIA. A′ +.

1. A′ + H + C + Typical ..... (Both HCl and combined chlorine in excess.)	1.	$a =$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
	2.	$a -$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
2. A′ + H 0, — or = C +...... (Without excess of HCl [H].)	1.	$a =$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
	2.	$a -$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
3 A′ + H + C — or =......... (Without excess of combined chlorine [C].)	1.	$a =$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
	2.	$a -$	1.	Without fermenta.ion	$(x\ 0)$.
			2.	With "	$(x\ +)$.

HYPOPEPSIA. A′ —.

1. A′ — H — or 0 Typical....... (All elements deficient.)	1.	$a =$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
	2.	$a -$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
2. A′ — H = or +.......... (Without deficiency of HCl [H].)	1.	$a =$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.
	2.	$a -$	1.	Without fermentation	$(x\ 0)$.
			2.	With "	$(x\ +)$.

APEPSIA. A o or — a o or — H o.

1. Without fermentation $(x\ 0)$.
2. With " $(x\ +)$.

SIMPLE DYSPEPSIA. A′ =.

1	$a =$	1.	Without fermentation	$(x\ 0)$.
		2.	With "	$(x\ +)$.
2.	$a -$	1.	Without fermentation	$(x\ 0)$.
		2.	With "	$(x\ +)$.

RESULTS OF QUALITATIVE AND QUANTITATIVE DETERMINATIONS RELATING TO SALIVARY DIGESTION AND THE STOMACH FLUID OBTAINED AFTER A TEST MEAL.

(The results given below represent the actual facts found in a case of hyperpepsia as taken from the author's office file.)

Case No.....*5284*....

Miss *B*.......... .... **Date.** ..*Aug. 25*,.....189.*5*..

Test Meal.—Regular Test Breakfast ... .

Time of Digestion:....*1*.....h....*13*....m..............

PHYSICAL AND MICROSCOPICAL CHARACTERS.

Physical. Normal.
Amount....*95*....c.c (40 c.c.); Disintegration....+....; Color.....*n*......
Residue.*25*..grms. (20 grms.); Mucus........*0*........; Odor.....*n*......
Microscopical.—Blood........; Pus........; Bacteria.........; Misc.........

COLORIMETRIC AND OTHER QUALITATIVE REACTIONS.

DIGESTIVE AGENTS.

Free HCl Congo Red....+.....Resorcine....+.....Dried Residue.....+.....
Pepsin.... ... **Rennet Ferment**...+... **Rennet Zymogen**...+... **Bile**..*0*..

DIGESTIVE PRODUCTS.

Proteids.—Syntonine...+..Propeptone...+..Peptone..+..Albuminoids..+..
Starch (Lugol's Sol.), Blue, Violet, Brown, Yellow, Colorless.

FERMENTATION PRODUCTS.

Lactic Acid......+......
Alcohol..................
Misc....................

Volatile Acids .... { Acetic............. / Butyric............ / Formic............

QUANTITATIVE CHEMICAL DETERMINATIONS.

DIGESTION OF ALBUMEN.

			Normal Quantities.*		
Total acidity, (A)	*.314*...	grms.	(.180-.200	grms.)	*A* †
Calculated acidity, (A′)**	*.362*...	"	"	"	A′
Total chlorine, (T)	*.390*..	"	(.300-.330	"	)
Free HCl, (H)	*.042*...	"	(.025-.050	"	) *H*
Combined chlorine, (C)	*.320*..	"	(.155-.180	"	) *C*
Fixed chlorides, (F)	*.032*...	"	(.100-.110	"	) $\frac{T-F}{T}$ =.66

DIGESTION OF STARCH.

Saliva, am't in 5 m....*11*.....grms. (1 c.c.) converted .1 grm. in....*13*.....m.
Maltose, (M).. *1.424*....grms.
Dextrine and Soluble Starch (D) .... *5.916*.... "
Fatty Acids (from fermentation) (L)......................... *.005*.... "
(Lactic acid. *.006*..grms. Volatile acids........grms.)

COEFFICIENTS OF DIGESTIVE WORK.††

Gastric Digestion { **Proteids** (*a*) .... *.83*.... **Fermentation** (*x*).*6*......
{ **Starch** (*b*) .... *.24*.... **Solution** (*y*)......*1.48*...
Salivary Activity (*c*)................ *.42*.... **Absorption** (*z*(... *.42*...
Coefficient of Chlorine Liberation (*m*)............................. *1.38*...
Proteid Digestion and Acid Fermentation (*a* and *x*).................... *1.03*...

Diagnosis.—... ....*Hyperpepsia with fermentation*.. *2—2—2.*

* The acidity (A and A′) and the quantities of chlorine in the different forms of (T), (H), (C), and (F), are expressed as HCl. The values given relate to 100 c.c. of stomach fluid. The amount of fatty acids, chiefly lactic (L), is expressed in grams of HCl, which should be multiplied by 2 to indicate the actual amount of lactic acid present. The amount of maltose (M), as well as that of soluble starch and dextrine (D), is expressed in grams of equivalent dextrose.

† By noting the sign following the symbols in this column and coefficients (*a*) and (*x*), and referring to the classification, the diagnosis of any case in relation to proteid digestion and fermentation may be easily made By transferring the figures to the blank for "Graphic Representation," the indications will be seen at once, the analysis thus furnishing a basis for rational treatment and the proper dietary.

** The calculated acidity (A′) is determined by the following formula: C + H − L = A′.

†† The normal amount of work is, in the case of each coefficient, represented by 1.00. The figures given usually represent the percentage of deviation from normal. The coefficient of fermentation represents the number of milligrams of lactic acid or combined fatty acids found in each 100 c.c. of stomach fluid (expressed in equivalent HCl).

The sign + indicates presence in normal quantity; ++ in excessive quantity; — in deficient quantity; 0 (zero) wholly absent.

Having determined all the above facts with accuracy, it is possible to classify each case, and thus the diet, treatment, necessary medicines, etc., are at once determined, as cases which are alike require like treatment. This method places the regulation of the diet of patients and their treatment upon a scientific, instead of an empirical and hap-hazard, basis, as heretofore, and enables the physician to deal with the worst classes of functional disorders of digestion with a high degree of satisfaction.

The Test Meal.— The meal should consist of one and one-half ounces of granola or granose, or two ounces of ordinary stale white bread, taken in the morning before having swallowed anything, either food or drink. The granose is much preferable to white bread, for the reason that bread contains the products of fermentation, together with yeast, which is likely to set up fermentation in the stomach. The granose or bread should be masticated thoroughly. After it has been eaten, eight ounces of water should be swallowed. At the end of an hour, counting from the time when the meal begins, the food should be removed from the stomach by means of a stomach-tube. For directions for the use of the stomach-tube, see page 898. All of the stomach fluid obtained should at once be placed in a clean bottle, carefully stoppered, and sent by express to the Laboratory of Hygiene of the Battle Creek Sanitarium, which, at the present time, is the only place in this country, and probably in the world, where analyses such as are here described are made.

DIET TABLES.

The following is a list of dietaries which are based upon observations made in connection with the exact methods of analysis of stomach fluids and the study of digestive disorders to which reference has already been made. They have been tested in the treatment of many thousands of invalids at the Medical and Surgical Sanitarium at Battle Creek, Mich., and have proven highly satisfactory. The dishes called for are cooked in accordance with recipes given in "Science in the Kitchen," by Mrs. E. E. Kellogg, A. M., published by the Modern Medicine Pub Co., Battle Creek, Mich.

Diet List No. 1.— Milk.

Hot milk.	Boiled milk.	Cream.	Kumyss.
Buttermilk.	Sterilized milk.	Cottage cheese.	Kumyzoon.

Diet List No. 2.

This list consists exclusively of farinaceous preparations of a character easy of digestion.

BREADS.

(Diet List 9.)

TOASTS.

Cream toast.	Snowflake.	Gravy toast.	Dry toast with hot milk.

SOUPS.

Cream rice soup.
Oatmeal soup.
Cream barley soup.
Corn soup.

GRAINS.

Gluten mush.
Oatmeal mush.
Graham mush.
Granola mush.
Mixed mush.
Corn-meal.
Barley gruel.
Graham grits gruel.
Gluten water gruel.
Oatmeal gruel.
Milk gruel.
Graham gruel.
Corn-meal gruel.
Oatmeal porridge.
Oatmeal blanc-mange.
Macaroni baked with granola.
Macaroni with cream sauce.
Jellied oatmeal.
Barley milk.
Bran jelly.
Rice molded.
Browned rice.
Rice.
Milk panada.
Rice water.
Grain jelly.
Cracked wheat.
Molded wheat.
Boiled wheat.
Rolled wheat.
Wheat gofio.
Graham grits.
Gluten.
Granola.
Rolled oats.
Rolled rye.
Pearl wheat.
Hulled corn.
Popped corn.
Hominy.
Hominy flakes.
Corn gofio.
Grains of gold.
Crystal Wheat.

Diet List No. 3.—Fruits.

This list contains only fruits.

(a) FRESH FRUITS.

Grapes.
Melons.
Raisins.
Oranges.
Pineapples.
Apples.
Peaches.
Bananas.
Cherries.
Pears.
Figs.
Currants.
Berries.
Dates.

(b) FRUITS COOKED WITHOUT SUGAR.

Baked apples.
Stewed raisins.
Apples stewed with raisins.
Stewed tomato.
Baked pears.
Stewed prunes.
Apple jelly without sugar.
Prune dessert.
Prune marmalade.
Cranberries and sweet apples.
Baked apple dessert.
Baked tomato.
Stewed prunes.

(c) FRUITS WITH SUGAR.

Unfermented wine.
Stewed fruits.
Canned fruits.
Grape jelly.
Fruit juices.
Baked quince.
Lemon apple.
Citron apple.
Bananas in fruit syrup.

Diet List No. 4.

This list consists of the most easily digestible vegetables.

SOUPS.

Split pea soup.
Lima bean soup.
Bean and tapioca soup.
Cream pea soup.
Pea and tomato soup.
Hominy and bean soup.
Lentil soup.
Black bean soup.

VEGETABLES AND LEGUMES.

Bean purée with lemon.
Bean and tomato purée.
Pea and tomato purée.
Peas purée.
Lentil purée.
Mashed peas with tomato sauce
Mashed black beans.
Mashed white beans.
Mashed Lima beans.
Mashed lentils.
Mashed potato.
Stewed potatoes.
Stewed celery.
Scalloped tomato.
Kornlet and tomato.
Pulp succotash.
Corn pulp.
Kornlet.
Cauliflower.
Baked potato.
Green peas.
Split peas.
Asparagus.

Diet List No. 5.

This list is composed entirely of preparations of eggs.

Medium boiled eggs.
Hard boiled yolks of eggs.
Beaten whole eggs.
Soft boiled eggs.
Poached eggs.
Floated eggs.
Curdled eggs.
Beaten whites of eggs.

Diet List No. 6.

The articles in this list contain milk or some cereal preparation in addition to eggs.

Gluten custard.
Gluten meal custard.
Bread custard
Farina custard.
Granose custard.
Rice custard.
Cracked wheat custard.
Cream toast with poached eggs.
Rice with egg.
Poached eggs on toast.

Diet List No. 7.

This list is composed of articles especially rich in nitrogenous elements other than casein, and hence especially indicated for cases of hypopepsia.

Unfermented breads (Diet List 9).
Egg preparations (Diet List 5).

Beans purée.
Peas purée.
Nuts purée.
Graham mush
Granola mush.
Gofio mush.
Cracked wheat.
Boiled wheat.
Pearled wheat.
Graham grits.
Gofio.
Rolled rye.
Gluten biscuit, 1, 2.
Beans.
Peas.
Lentils.
Lentil butter.
Almond meal.
Peas with nuts.
Nut meal.
Nut porridge.

Diet List No. 8.

Foods which are easily disintegrated and hence adapted to cases of dilatation of the stomach.

UNFERMENTED BREADS.

(Diet List No. 9.)

GRAINS.

Gluten mush.
Granola mush
Granose.
Granola.
Gluten.
Corn gofio.
Rice.
Browned rice.
Popped corn.

FRESH FRUITS.

Strawberries.
Grapes.
Oranges.
Ripe sweet apples.

FRUITS WITHOUT SUGAR.

Baked apples.
Stewed prunes.
Prune dessert.
Fruit juice.

FRUITS COOKED WITH GRAINS.

Graham peach mush.
Grape mush.
Granola grape mush.
Oatmeal fruit mush.
Granola fruit mush.
Granola peach mush.
Graham apple mush.
Blackberry mush.
Raspberry granola mush.
Granola apple mush.
Lemon barley gruel.
Raspberry grits gruel.
Raisin gruel.
Lemon gluten gruel.
Grape gruel.
Lemon oatmeal gruel.
Boiled wheat with lemon sauce.
Macaroni with tomato sauce.
Rice with fig sauce.
Farina with fig sauce.
Pearl barley with lemon sauce.
Grape toast.
Prune toast.
Banana toast.
Tomato toast.
Apricot toast.
Berry toast.
Peach toast.
Farina fruit mold.
Red rice mold.
Pearl wheat with raisins.
Wheat with berries.
Farina with fresh fruit.
Rice and stewed apple dessert.
Cracked wheat with steamed apple.
Graham grits with raisins, dates, or figs.
Pearl barley with raisins.
Rice with raisins.
Apple macaroni.
Stewed fruit pudding.
Wheat with peaches.
Rice with peaches.
Prune pie with granola crust.
Granose shortcake.

VEGETABLES AND LEGUMES.

Peas purée.
Lentil purée.
Split peas.
Green peas.
Vegetable broths.
Corn pulp.
Kornlet.
Asparagus.
Nuts with lentils.

EGGS.

Medium boiled eggs.
Beaten whites of eggs.
Hard boiled yolks of eggs.
Poached eggs.
Curdled eggs.
Floated eggs.
Soft boiled eggs.
Beaten whole eggs.

MISCELLANEOUS.

New Era Kumyss.
Kumyss nog.
Kumyzoon.
Sterilized butter.
Caramel-cereal.
Bromose.
Nut butter.
Nut meal.

Diet List No. 9.—Unfermented Breads.

Whole-wheat puffs.
Corn puffs.
Graham puffs.
Rolls.
Toasted rolls.
Fruit rolls.
Breakfast rolls.
Graham gems.
Rye gems.
Blueberry gems.
Snow gems.
Whole-wheat gems.
Gluten wafers.
Whole-wheat wafers.
Toasted wafers.
Dyspeptic wafers.
Crisps.
Graham crisps.
Graham crackers.
Toasted beaten biscuit.
Beaten biscuit.
Fig sandwich.
Apple sandwich.
Graham flakes.
Gluten.
Granola.
Crusts.
Zwieback.
Sticks.
Hoe cake.

ASEPTIC DIETARY.

Especially adapted to cases in which fermentation is present, also in cases of chronic biliousness, sick headache, jaundice, Bright's disease, gastric and intestinal catarrh, simple dyspepsia, most cases of hyperpepsia, and cases of hypopepsia not of extreme degree.

A. Sterilized Foods Prepared without Milk or Eggs.

Peas purée.
Lentil purée.
Beans purée.
Nuts purée.
Granose.
Granola.
Macaroni with tomato sauce.
Fruit toast.
Vegetable broths
Corn soup.
Bromose.
Nut porridge.
Nut butter.
Nut meal.
Sterilized butter.

GRAINS.

Gluten mush.
Granola mush.
Barley gruel.
Corn-meal.
Cracked wheat.
Boiled wheat.
Molded wheat.
Bran jelly.
Jellied oatmeal.
Rolled oats.
Rolled rye.
Hulled corn.
Hominy flakes.
Oatmeal blanc-mange.
Graham gruel.
Oatmeal gruel.
Rice water.
Rice molded.
Grain jelly.
Browned rice.
Gluten.
Pearl wheat.
Rolled wheat.
Graham grits.
Graham mush.
Oatmeal mush.
Mixed mush.
Rice.
Grains of gold.
Hominy.
Popped corn.
Gluten water gruel.
Graham grits gruel.
Corn-meal gruel.
Corn gofio.
Wheat gofio.

Split pea soup.
Green peas.
Stewed potatoes.
Corn pulp.
Pulp succotash.
Baked potato.
Lentil soup.
Kornlet and tomato.
Kornlet.

Lentil toast.
Zwieback.
Crystal Wheat
Sticks.
Granose brown bread.
Crisps.
Unfermented breads prepared without milk.

FRESH FRUITS.

Grapes.
Raisins.
Apples.
Berries.
Cherries.
Currants.
Peaches.
Oranges.
Pineapples.
Pears.
Figs.
Bananas.
Melons.
Dates.

FRUITS COOKED WITHOUT SUGAR.

Baked apples.
Baked pears.
Prune marmalade.
Prune dessert.
Baked apple dessert.
Baked tomato.
Stewed raisins.
Steamed prunes.
Apple jelly without sugar.
Cranberries and sweet apples.
Stewed prunes.
Apples stewed with raisins.
Stewed tomato.

Fruits cooked with grains.
Pearled wheat with raisins.
Pearled barley with raisins.
Cracked wheat with steamed apple.
Farina with fig sauce.
Rice with fig sauce.
Rice with raisins.
Rice with peaches
Graham grits with raisins or figs.
Graham apple mush.
Granola fruit mush.
Farina with fresh fruit.
Poached eggs.
Raisin gruel.
Macaroni with tomato sauce.
Banana toast.
Tomato toast.
Prune toast.
Prune pie with granola crust.

B. Foods which Encourage Asepsis of the Stomach and Intestines.

All the articles named in the preceding list of Sterilized Foods Prepared without Milk or Eggs, with the addition of the following:—

Kumyss.	Floated eggs.	Soft boiled eggs
Kumyzoon.	Poached eggs.	Beaten whole eggs.
Medium boiled eggs.	Curdled eggs.	Cottage cheese.
Beaten whites of eggs.	Hard boiled yolks of eggs.	

C. Foods that are Rendered Sterile by a Stomach of Moderate Digestive Vigor.

All the preparations of grains, fruits, milk, eggs, and easily digested vegetables in Diet Lists Nos. 1 to 10, avoiding only raw milk.

With this list it is necessary for many patients who have long suffered from dilatation of the stomach, to employ some intestinal antispeptic, of which the best is charcoal, in the form of Antiseptic Charcoal Tablets.

DRY DIETARY.

A dry dietary is indicated in cases in which there is dilatation of the stomach with slow absorption. In cases of this sort, liquid foods remain too long in the stomach.

The chief purpose of a dry dietary is to secure thorough mastication of the food, hence the articles in the following lists should be taken without water, milk or other liquid. Granose is an ideal article of food for a dry diet, as it stimulates the flow of saliva to a greater extent than any other food with which we are acquainted. Granose combined with nuts, nut meal, bromose, or the yolks of hard boiled eggs may often be eaten with advantage almost exclusively for a few days at the beginning of a course of dry diet.

A. Dry Diet.

This list includes all the Unfermented Breads (Diet List No. 9), and in addition,—

Yolks of hard boiled eggs	Raisins.	Sterilized butter.
Granose.	Bromose (dry).	Nut butter.
Steamed figs.	Popped-corn.	Nut meal.

B. Modified Dry Diet.

This list includes all the preceding list (A), and in addition the following:—

Poached eggs.	Beaten whole eggs.	Popped corn.
Curdled eggs.	Nuts.	Mashed peas.
Floated eggs.	Granose grits.	Mashed beans.
Beaten whites of eggs.	Browned rice.	Stewed prunes.

LIQUID DIETARY.

A liquid dietary is especially indicated in fevers, and in some cases of painful dyspepsia, especially cases of hyperpepsia accompanied by much irritation, as indicated by pain on pressure over the pit of the stomach and pain after eating. The purpose of a liquid diet is to present nutriment in a form which will tax the stomach as little as possible and secure the early emptying of the stomach by the passage of its liquid contents into the small intestine.

Gluten gruel.	Fruit juices.	Kumyss.
Malted gluten gruel.	Barley water.	Kumyzoon.
Fruit and nuts gruel.	Nut porridge.	Kumyss nog.
Nuts and gluten gruel.	Cream.	Cottage cheese.
Vegetable soup (pea, lentil, bean, tomato, rice, barley, and corn).	Hot milk.	Curdled eggs.
	Boiled milk.	Beaten whites of eggs.
	Buttermilk.	Beaten whole eggs.
Vegetable broth.	Custard.	Bromose.

NITROGENOUS DIETARY.

The nitrogenous elements of food are also peptogens; that is, they stimulate the secretion of gastric juice, and hence foods of this class are especially adapted to cases of hypopepsia and apepsia, in which the production of gastric juice is always deficient. Albumen and casein are the most important nitrogenous elements. Eggs consist chiefly of albumen; milk contains casein in abundance; nuts are rich in albumen and vegetable casein; peas, beans, and lentils contain a very large proportion of vegetable casein. At the beginning of a course of treatment, in extreme cases of apepsia and hypopepsia, it is sometimes necessary to confine the diet to a single nitrogenous food, as kumyss or kumyzoon. Later, eggs may be added advantageously, then some farinaceous food, as granose, with nuts, and still later the various unfermented breads and soft grain preparations; but dry foods are to be preferred.

Milk (Diet List No. 1).	Unfermented breads (Diet List No. 9.)
Eggs (Diet List No. 5).	Diet List No. 7.

NUT PREPARATIONS.

Almond meal.	Beans with nuts.	Nut porridge.
Lentils with nuts.	Nuts purée.	Nut butter.
Peas with nuts.	Bromose.	Nut meal.

NON-FARINACEOUS DIETARY.

Suitable for cases in which there is inability to digest starch, as shown by acidity, fulness after eating, and eructations of gas.

FRESH FRUITS.

Grapes.	Oranges.	Bananas.	Berries.	Cherries.	Raisins.
Peaches.	Melons.	Apples.	Pineapples.	Pears.	Figs.

FRUITS COOKED WITHOUT SUGAR.

Apples stewed with raisins.	Baked tomato.	Steamed prunes.
Apple jelly without sugar.	Baked apples.	Stewed raisins.
Cranberries and sweet apples.	Baked pears.	Stewed tomato.
	Stewed prunes.	Prune dessert.

EGGS.

Medium boiled eggs.	Poached eggs.	Soft boiled eggs.
Beaten whites of eggs.	Curdled eggs.	Beaten whole eggs.
Hard boiled yolks of eggs.	Floated eggs.	

MILK.

Cream.	Boiled milk.	Kumyss.
Hot milk.	Malted milk.	Kumyzoon.
Sterilized milk.	Buttermilk.	Cottage cheese.

NUTS AND GLUTEN.

Nut preparations (see Nitrogenous Dietary).	Gluten.
Malted gluten.	Gluten biscuit.

FATTENING DIETARY.

Those foods which abound in starch, sugar, dextrine, and easily digested fats, are the most conducive to fattening. At the head of the list stands bromose, which contains 1-5 its weight of emulsified or partially digested nut fat, and nearly 40 per cent of digested starch. The following articles are fattening in character:—

Milk (Diet List No. 1).	Eggs (Diet List No. 5).	Diet List No. 9.
Grains (Diet Lst No. 2).	Diet List No. 6.	Bromose.
Fruits (Diet List No. 3).	Diet List No. 8.	Sterilized butter.
Vegetables (Diet List No. 4).		Nut preparations.

ANTI-FAT DIETARY.

An anti-fat dietary need not necessarily exclude all starchy foods. The most important points to be observed are—

1. Limitation of food to the smallest amount with which the strength can be maintained.
2. Restriction of the diet to one, or at most to two or three, articles.
3. Avoidance of fats.
4. Avoidance of liquid foods of all sorts. If kumyss or kumyzoon are used, they should be made the sole dietary.

Kumyss.	Beaten whole eggs.	Grapes.
Kumyzoon.	Vegetable broth.	Lemons.
Granose (eaten dry).	Gluten.	Celery (cooked).
Hard rolls.	Gluten biscuit.	Asparagus.
Water biscuit.	Gluten wafers.	Tomatoes.
Medium boiled eggs.	Gluten custard.	String beans.
Beaten whites of eggs.	Sour apples.	Green peas.
Poached eggs.	Oranges.	Greens.
Curdled eggs.	Strawberries.	Sticks.
Floated eggs.	Bananas.	Zwieback.
Soft boiled eggs.		

HEALTH FOODS.

THE increasing feebleness of the American digestion, and the harassing headaches, neuralgias, nervous exhaustions, and multitudinous other ailments growing out of it, have stimulated a world-wide search for artificial means of aiding the feeble American stomach. The pig, the calf, the barnyard fowl, and even the ostrich have been called upon to contribute the powerful digestive agents with which nature has blessed these animals; nevertheless, the evil increases from year to year in consequence of inattention to the natural demands of the human digestive organs. The remedy for our national malady is not to be found in supplementing the natural digestive powers of the body by artificial digestive agents, with the expectation of being thereby able to digest the indigestible viands and mixtures with which the vicious methods of modern cookery supply our tables. The real remedy is to be sought in the study of the natural dietetic needs of the body and the substitution of specially healthful and easily digestible foods for the dyspepsia-making compounds which constitute the average bill of fare.

More than twenty years ago the writer set himself to work to discover and devise food preparations which, while possessed of the highest qualities as regards digestibility, should at the same time be toothsome and acceptable to the most fastidious palate. The research thus begun included a study of the dietetic habits and the food substances employed by the people of all the principal countries of the world, both civilized and uncivilized. The food museums of this country and Europe were visited and carefully studied. Specimens of native foods were collected from all parts of the Old and the New World, and from the islands of the sea. Chemical and food laboratories, and an experimental kitchen, well-equipped with experts in the special lines of investigation required, were instituted. The qualities of the various products developed were tested, and their value demonstrated in the treatment of the thousands of invalids who annually frequent the Battle Creek Sanitarium. As the result of this extended inquiry, which, in its practical thoroughness far exceeded any investigation of a similar sort which had ever before been undertaken, a few choice preparations possessed of intrinsic and specific merit

have been developed, and are now offered to the public with the confidence that the thorough criticism to which they have already been subjected, has established their value beyond the possibility of question. Heretofore these foods have been manufactured almost exclusively for the use of the Battle Creek Sanitarium and the families of patients, who, learning their value at this institution, desired to obtain supplies of the same foods after returning to their homes. For some time the demand has exceeded our capacity to manufacture the foods, but enlarged facilities have now been provided, and these invaluable preparations are presented to the general public.

A few of the hundreds of preparations which have been devised, have proven to be especially suited for general use by those in health as well as by invalids, possessing, as they do, unequaled properties as regards their nutrient value and digestibility. The following are a few of the most important: —

Granola.— This preparation is composed of the most nutritious and easily digested grains, from which all foreign and indigestible substances have been removed. In the manufacture, the cereals are subjected to processes whereby the starch is partially digested and prepared for immediate digestion and assimilation.

Granola requires no cooking. It is used with milk, cream, or liquid food of any kind. It makes most delicious porridge, mush, pie-crust, and desserts, and is vastly superior to bread-crumbs for all purposes for which the latter are used.

Specially suited to cases in which the stomach requires well disintegrated foods, as in cases of dilatation, for children in whom the teething process has begun, and for elderly persons and travelers who desire to carry the largest amount of nutriment in the smallest bulk.

Granose.— This is one of our most recently perfected foods, and is perhaps the best suited of any for general use. Prepared from the choicest wheat, it contains the whole grain. Subjected to processes of cerealine digestion, cooking, roasting, steaming, and disintegration, it is prepared for immediate use, digestion, and assimilation. It is *palatable, crisp, delicious.* It is relished and retained when all other foods are rejected. It may be used in soups, with milk or cream, or in numberless combinations with fruit and eggs.

Especially valuable in cases of chronic constipation, which are almost invariably cured, or at least almost wholly relieved, by its continuous use. In acid dyspepsia, and, in fact, in most forms of indigestion, granose is almost a panacea. Like bread, it combines well with all other articles of food, and is exceedingly appetizing, its form, that of large flakes, appeal-

ing to the eye as strongly as does its nutty, crisp, and delicate flavor to the sense of taste.

Crystal Wheat.— This is a preparation of wheat which contains the whole grain, thoroughly cooked, partially digested, and prepared in such a manner that when moistened and heated for use, it is entirely free from the pasty qualities of ordinary cooked grains, reminding one of well-cooked rice, but having a much more decided and tasty flavor. This preparation is exceedingly palatable and digestible, and by virtue of its extreme digestibility it agrees with stomachs which will not accept most other articles of food. This food is especially to be commended for persons suffering from constipation, acid dyspepsia, hyperpepsia, and, in fact, in most forms of indigestion. It will be found a most agreeable substitute for cracked wheat, rolled wheat, oatmeal, and, in fact, most other grain preparations, to which it is greatly superior.

Caramel-Cereal.—This is a wholesome substitute for tea and coffee. The poetic reference of Coleridge, "The cup that cheers, but not inebriates," has been proven by experience to be misapplied to tea and coffee, but may be properly used in relation to Caramel-Cereal. The well-known effects of tea and coffee in provoking indigestion and special nervous disorders have created a demand for a wholesome substitute.

Lac Vegetal (vegetable milk).—The composition of Lac Vegetal, a purely vegetable product, very closely resembles that of mother's milk. The several constituents are as follows: Vegetable fat, emulsin (closely allied to casein), maltose, dextrose, and levulose. It may be obtained from the Modern Medicine Company, Battle Creek, Mich.

Wheatena.— A partially digested food prepared in essentially the same manner as Granola, except that it is composed wholly of one grain; namely, the choicest wheat, containing the highest proportion of gluten, the chief brain and blood-building element of the grain. It may be used in the same way as Granola.

Avenola.— This preparation, like Granola and Wheatena, is a partially digested food. Its principal constituent is the finest preparation of oats. This preparation is especially rich in phosphates and in fat-making elements, which render it especially valuable for persons who desire to gain in flesh. It has a delicate, nutty flavor, which reminds one of Gofio, the world-famed food of the Canary Islanders. It is used the same as Granola and Wheatena.

Zwieback.—This is simply twice-baked bread. By exposure in an oven of moderate heat, the slices of bread are slowly baked until the whole thickness of the slice has acquired a brown color and the crispness

and sweetness of the crust of a well-baked loaf. It is one of the most nutritious, palatable, and digestible of foods. Used with milk, cream, or fruit juice, it is a real delicacy. It is both nourishing and easy of digestion. Zwieback is one of the characteristic features of the diet at Carlsbad, the famous Bohemian watering-place.

Bromose.— Are you thin ? Have you hollow cheeks, hollow eyes, and a general emaciated appearance ? Would you like to be fat ? We will tell you how : Eat Bromose !

Bromose, an exceedingly palatable food preparation, consists of cereals and nuts, in which the starch is completely digested, the nuts perfectly cooked, and their fat emulsified. It is thus ready for immediate assimilation. It is the most easily digested and most fattening of all foods, and at the same time rich in proteids, and hence unequaled as a tissue-builder.

Bromose makes fat and blood more rapidly than any other food. It is the food par excellence for blood, brain, and nerves. Invalids whose troubles are due to the fact that they cannot digest the starch of cereals and vegetables, find in Bromose a panacea. Bromose is rich in salts, as well as proteids and food elements. It is excellent for weak, emaciated invalids, and feeble children.

Nut Meal.— This preparation is made from carefully selected and prepared nuts. It is one of the most nourishing and digestible of all the food products of the vegetable kingdom. It is especially adapted for patients who have difficulty in digesting starch, and for those who need to make a rapid gain in flesh. It agrees well with the most delicate stomachs, and will often be digested when the stomach will tolerate nothing else.

Nut meal may be eaten dry, or combined with other foods, or mixed with a little hot water, when, with the addition of a little salt, it makes a delicious soup or purée.

Nut Butter.— A capital substitute for animal fats of all sorts in the seasoning or shortening of foods, in the preparation of gravies, sauces, etc. Thoroughly cooked and emulsified, so it dissolves readily in water ; has a rich, nutty flavor ; is exceedingly palatable and digestible, keeps well, is thoroughly sterilized, and free from all objections which can be urged against animal fats. It gives a meaty flavor to soups.

Almond Meal.— This is simply a fine meal prepared from the choicest blanched almonds, especially designed for diabetics and invalids who cannot digest starch. It is highly nutritious, exceedingly delicate and palatable, and an admirable food for those who need to make a gain in flesh.

GLOSSARY.

FOR WORDS NOT FOUND IN THE FOLLOWING LIST, THE READER SHOULD CONSULT THE GENERAL INDEX.

Abnormal, unnatural, unhealthy.
Accoucheur, obstetrician.
Amblyopia, degeneration of the optic nerve.
Ameboid, like an amæba.
Amorphous, of irregular form.
Anomalous, contrary to a general rule.
Antidote, something which will counteract the effects of a poison.
Antiseptic, preservative agent.
Antiphlogistic, opposed to fever or inflammation.
Aphthous, affected with aphthæ.
Articulation, the union of two bones.
Ascites, dropsy of the peritoneum.
Asphyxia, suspended animation.
Asthenia, debility, lack of strength.
Atònic, wanting tone.
Auditory. pertaining to the act of hearing.
Autopsy, examination after death.
Axilla, hollow beneath the shoulder.
Bilateral, having two sides.
Blue stone, blue vitriol.
Bolus, a large pill.
Bougie, a long, flexible instrument for dilating narrow passages.
Bursa, a sac.
Cachexia, a diseased condition of the nutritive system.
Cachectic, unhealthy.
Calculus, a hard concretion.
Canthus, the angle of the eye.
Capillary, resembling a hair.
Caries, ulceration of bone.
Carpus, the bones forming the wrist.
Catamenia, the menstrual period.
Cautery, a burning or searing.
Cerebral, pertaining to the cerebrum.
Cerebration, cerebral activity, thought.
Cerumen, ear-wax.
Cervix, neck.
Chlonic, convulsion with alternate relaxation.
Cicatricial, scar like.
Climacteric, a critical period of life.
Coagulum, a clot or curd.
Collapse, a sudden failure of the vital force.
Colliquative, relating to discharges producing great exhaustion.
Collyrium, an application to the eye.
Coma, a profound state of sleep, from which it is hard to rouse a person.
Congenital, dating from birth.
Congestion, unnatural accumulation of blood in a part.
Contagion, an agency by which diseases are transmitted.
Contagious, communicable by contact.
Convalescence, the stage of recuperation after illness.
Copperas, green vitriol.
Coryza, nasal catarrh.
Cranium, the skull.
Cretinism, a state of idiocy accompanied by goitre.
Crisis, the turning point.

Cuticle, the outside skin.
Cutis, the "true skin."
Decussate, to cross.
Demulcent, a substance of bland, soothing nature.
Depletion, lessening of vitality or activity.
Dermatologist, a specialist in skin diseases.
Desiccated, dried.
Diagnosis, the discrimination of disease.
Diaphoretic, a remedy which will induce perspiration.
Diathesis, constitutional affection or tendency.
Diuresis, an increased secretion of urine.
Diuretic, a medicine which will increase the secretion of urine.
Dorsal, pertaining to the back.
Dorsum, the back.
Dysuria, difficult urination.
Ecchymosis, a discolored spot, the effect of a bruise or rupture.
Effusion, the escape of fluid out of its natural vessel into another part.
Electrotherapy, treatment of disease by electricity.
Emmenagogue, a remedy that promotes the menstrual flow.
Endemic, a disease arising from some peculiarity of situation or locality.
Entozoa, internal parasites, worms.
Ephemera, fever of short duration.
Epidemic, a disease attacking at the same time a number of individuals, supposed to be caused by some peculiar condition of the atmosphere.
Epigastrium, pit of the stomach.
Epistaxis, nosebleed.
Erotic, passionate, sensual.
Empiricism, quackery.
Erethism, irritation, excitement.
Etiology, that department of medical science which treats of the causes of disease.
Excoriated, raw, deprived of skin.
Expectant medication, a method in which the patient is left almost wholly to the efforts of nature.
Extravasation, escape of fluid into the tissues.
Exudation, oozing of fluid through the pores of a membrane or skin.
Fascia, the thin, tendinous covering of muscles.
Fauces, the posterior portion of the mouth.
Febrile, feverish.
Fluor albus, whites, leucorrhœa.
Feces, excrement, natural discharge from the bowels.
Follicle, a gland in a membrane.
Fomites, substances supposed to retain disease germs.
Fontanel, soft spot on head of infant.
Foramen, a cavity.
Fungus, a morbid growth.
Galactorrhœa, excessive secretion of milk.
Ganglion, a collection of nerve cells.
Gangrene, mortification.
Gastric, pertaining to the stomach.
Globus hystericus, sensation of a lump in the throat.
Glottis, the openings between the vocal cords.
Grumous, clotted.
Gynecologist, a specialist in diseases of women.
Hemicrania, a pain affecting but one side of the head.
Hepatic, pertaining to the liver.
Homologous, similar in structure.
Hydatid, a tumor containing transparent fluid.
Hydropathy, the science of the use of water as a remedial agent.
Hydriatics, hydrotherapy.
Hyperesthesia, unnatural sensibility.
Hypertrophy, over-growth.
Hypnotic, a remedy which induces sleep.
Hypodermic, under the skin.

Hydrotherapy, hydropathy.
Idiopathic, a primary disease.
Idiosyncrasy, a peculiarity of constitution.
Inanition, exhaustion from want of nourishment.
Incubation, the period between the exposure to a contagious disease and the attack resulting from it.
Infection, contagion.
Inguinal, pertaining to the groins.
Insomnia, absence of sleep.
Intermittent, a disease which subsides at certain intervals.
Labia, lip.
Lactation, the period of milk secretion.
Lamina, a thin plate or scale.
Lateral, pertaining to the side.
Lesion, an injury of structure.
Lethargy, unnatural sleepiness.
Lithotomy, the operation for stone in the bladder.
Lobe, a round projecting division of an organ.
Lumbar, pertaining to the loins.
Lymph, fluid of the lymphatics.
Maceration, soaking.
Materia medica, science of medicine.
Menstruum, fluid medium.
Metamorphosis, complete change of form.
Metastasis, a change in the seat of disease.
Moribund, dying.
Narcotism, narcotic poisoning.
Nates, buttocks.
Nephritic, pertaining to the kidneys.
Neurosis, disease of the nerves.
Node, a protuberance.
Normal, natural.
Nostrum, patent medicine.
Nuchæ, nape of the neck.
Occiput, back part of the head.
Œdematous, dropsical swelling which pits on pressure.
Oil of vitriol, sulphuric acid.
Olfactory, pertaining to the sense of smell.
Ophthalmic, pertaining to the eye.
Osmosis, circulation of fluids through moist membranes.
Ossification of bone, formation of bone.
Ovariotomy, the operation of removing the ovary.
Ovum, egg, female element of generation.
Panacea, a universal remedy.
Paracentesis, the operation of tapping to evacuate fluid in dropsy.
Paralysis, loss of sensation or power of motion.
Parietes, inclosing walls.
Paroxysm, a sudden violent action.
Pathology, the science of diseases.
Pathognomonic, characteristic.
Pectoral, relating to the breast.
Pedicle, the stalk, or neck.
Pediluvium, a bath for the feet.
Pellicle, a thin skin or membrane.
Petechiæ, small spots in shape and color resembling flee-bites.
Pharynx, upper portion of the throat.
Phlebitis, inflammation of the inner membrane of a vein.
Phlebotomy, blood letting.
Phlegmasia-dolens, milk-leg.
Pitting, indentation produced by pressure with the finger.
Plethora, a condition in which there is a superabundance of blood.
Pleurodynia, pain in the chest.
Plexus, a net work of vessels or nerves.
Polypus, a variety of tumor.
Post-mortem, after death.
Primæ viæ, the alimentary canal.
Process, a prominence on a bone.
Prognosis, a judgment respecting the progress or result of a disease.
Prolapsus, falling.
Prophylactic, a preservative remedy.
Pruritus, itching.
Pseudo, spurious.

Psychology, science of mind.

Ptyalism, an excessive secretion of saliva.

Puerperal, pertaining to childbirth.

Pulmonary, pertaining to the lungs.

Pyrexia, condition of normal heat.

Regurgitation, the rising of fluids into the mouth.

Remittent, abating periodically in severity.

Rigor, sensation of cold with shivering.

Spectroscope, an instrument used in spectrum analysis.

Soporific, productive of sleep.

Sedatives, medicines which depress the vital forces.

Senile, relating to old age.

Sensorium, the common center of sensations.

Sequelæ, morbid conditions sometimes left by an acute disease.

Serum, a component of the blood.

Sialogogues, remedies which increase the secretion of saliva.

Slough, to come off ; mortification.

Sopor, deep sleep.

Sphincter, a circular muscle.

Sputum, matter expectorated.

Sporadic, a disease which arises from an accidental cause.

Stertor, snoring, breathing.

Strangulation, a stoppage of the circulation by compression.

Stupor, unconsciousness.

Subcutaneous, underneath the skin.

Sudorific, a medicine which induces perspiration.

Synchronous, simultaneous.

Syncope, fainting.

Tenesmus, constant desire to evacuate the bowels.

Traumatic, pertaining to a wound.

Trismus, partial lockjaw.

Therapeutics, that branch of medical science which considers the treatment of disease.

Vasomotor, pertaining to the motion of the blood in the vessels.

Velum, a veil.

Ventral, abdominal.

Vesication, formation of blisters.

Virus, poison.

Viscus, any internal organ.

Viscera, plural of viscus.

Vivisection, dissection during life.

Volition, will.

Vomica, a cavity in the lungs.

INDEX OF SYMPTOMS.

GENERAL INDEX.